NOVEMBER 1961

Agricultural Engineering

The Journal of the American Society of Agricultural Engineers

An invitation...

to attend
and participate
in a week
of agricultural
engineering
activities

December 13-15

Annual
Winter Meeting
over 140 technical papers

December 12-14

Agricultural Engineering
Exposition
products for engineered agriculture

December 12

Tooling Up for
Systems Farming
ASAE-FEI Joint Conference

December 13-14

Open Forums
and
Machines of Tomorrow

Week of
December 11

NOW, THEREFORE, I, Richard J. Daley, Mayor of the City of Chicago, do hereby proclaim the week beginning December 11, 1961, to be "AGRICULTURAL ENGINEERS WEEK IN CHICAGO," and urge citizens of our city, and of this area aptly designated as "the nation's breadbasket" to take cognizance of the special events arranged in connection with this important meeting.

EXPOSITION ISSUE

Agricultural Engineering

Established 1920

CONTENTS · NOVEMBER 1961 · Vol. 42, No. 11

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JAMES BASSELMAN, *Editor and Publisher*

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Exposition Issue

THE November issue features a new event in ASAE history — opening day, 2:00 p.m., December 12, of the first ASAE-endorsed Agricultural Engineering Exposition. On that day a wide variety of producers of products, components, and services will open an exhibit which will last for three days in the Exhibit Hall of Chicago's Palmer House in conjunction with the ASAE Winter Meeting.

The basic goal of the first Agricultural Engineering Exposition is to provide development, design and research engineers working in the field of agriculture with an excellent and unusual opportunity to inspect and obtain first-hand, authoritative information concerning a wide variety of components, equipment and materials to assist in the solution of problems confronting them. A review of the listing of exhibitors and description of exhibits (page 626) indicates that the goal has been accomplished.

In endorsing the Exposition, the ASAE Board of Directors expressed the feeling that an Exposition held in conjunction with the Winter Meeting, planned especially for agricultural engineers, would add considerably to the educational value of the three-day meeting. The Exposition provides a splendid opportunity for members and visitors engaged in the engineering phases of agriculture to see, inspect, talk, and discuss components and product development. Best of all, when visiting the exhibit booths, the agricultural engineer can converse with the very people responsible for the new developments.

It has been noted, also, that exhibiting firms have staffed their booths with top echelon personnel well versed in the design, application, and maintenance phases of their products. Their requests for exhibitor identification badges reveal such titles as president, executive vice-president, chief engineer, district engineer, senior sales engineer, manager of machinery division, manager of marketing services, director of engineering, etc.

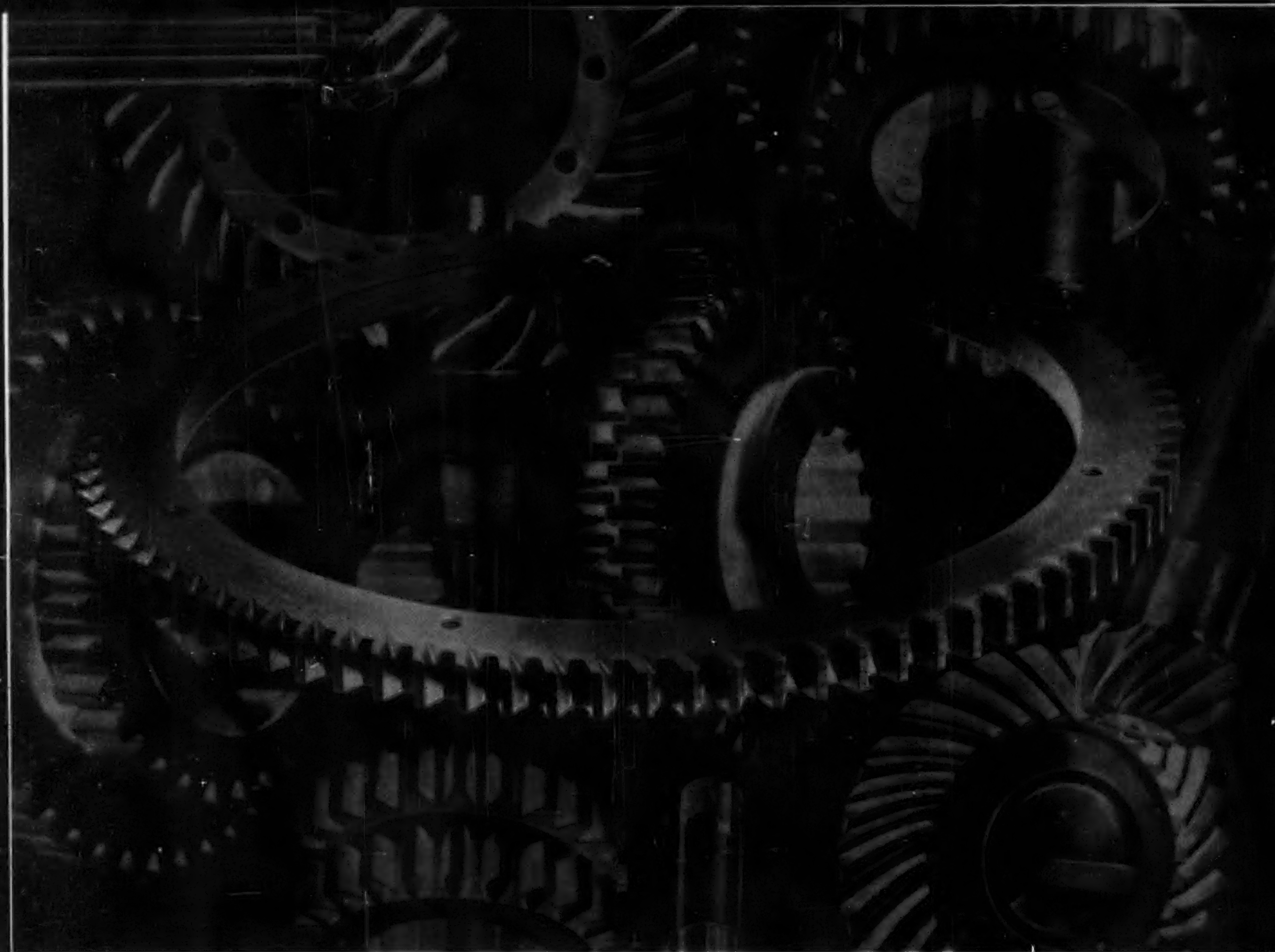
These men will carefully explain their product displays to visitors inspecting farm structures, bearings, motors, power transmission equipment; nuts, screws, pins, and brackets for application by resistance welding; air cooled engines, harrow disks, irrigation equipment, etc. Exhibit booths will receive visitors on December 12, 13, and 14 from 2:00 p.m. to 9:00 p.m.

A floor plan of the Exhibit Hall appears on page 626.

About the Cover

MEMBERS will, perhaps, be surprised at the "new face" on the front cover of this issue. It was decided that, since the week of December 11 provides such a concentrated array of agricultural engineering activities, it would be appropriate to give additional emphasis to the week through a special cover. The November number, as indicated on pages 626 and 627, also will serve as a special Exposition Issue as approximately 1,500 copies, in addition to the normal circulation, will be distributed to visitors attending the first Agricultural Engineering Exposition. The standard front cover format will be resumed in December.

Visit our Booth 106 at Agricultural Engineering Exposition.



Report to Readers . . .

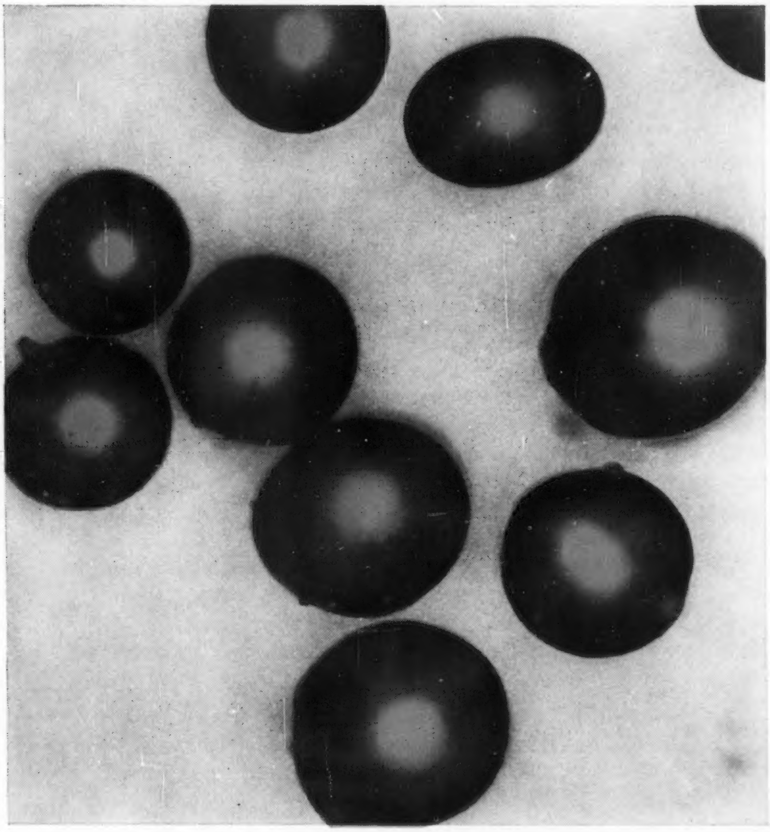
SIMPLE RIG PUTS DITCH IRRIGATION ON WHEELS A University of Wyoming agricultural engineer, it seems, has made a significant new development in moving irrigation water over ditch banks into fields where it is to be used, without the soil washing and loss of plants that result from use of open-end siphons. This engineer conceived the idea of using the head of water in the irrigation ditch to drive a couple of undershot water wheels, which serve to break the force of the water flowing from the ditch sufficiently, by the time it reaches the soil, to reduce washing to a minimum. The water wheels by means of a gear train turn a cleated track, on which the whole assembly moves along the ditch bank at a speed of about ¾ foot a minute, which can be increased or decreased.

DRAINAGE STUDIES UNDER CONTROLLED CONDITIONS A new test facility for studying drainage under controlled conditions is being constructed by the California AES at Davis. The first tank to be installed will be used for testing drainage tile lines of various lengths and materials, as well as drainage pipes of both plastic and fibrous materials. . . . . The first experiment will seek to determine the effect of crack widths between tiles on drainage flow into tile lines. A study will also be made of the spacing of perforations in solid pipes constructed of bituminous fiber. . . . . Each tank is to be filled with soil of a different texture to provide a more satisfactory understanding of drainage design problems. The studies will investigate such factors as depth and spacing of tile lines, accumulation of salts on the soil surface as related to drainage, and the use of interceptor drains in areas where water moves laterally through the soil.

GROWING IMPORTANCE OF SELF-UNLOADING WAGON Whether for bunk feeding as practiced by cattle feeders, or for green chop feeding which is being increasingly utilized by milk producers, the self-unloading wagon has gained favorable acceptance rapidly. Ohio SU dairy specialists recommend feeding of forage in the feedlot not only for reasons of health but also for better control of milking schedules. Where space is adequate, the self-unloading wagon can be used for delivering feed direct to mangers. . . . . The self-unloading wagon, as compared with other means of mechanized feeding, has the advantage of being the most flexible since it usually requires only a minimum of construction changes.

NEW MACHINE FIGHTS FOREST FIRES BY SMOTHERING THEM Federal and state forestry scientists are now developing at Michigan's forest fire experiment station a device for fighting forest fires by smothering them. The machine, called a sandthrower, operates by digging its own supply of sand or soil and throwing it on the fire. Tests have shown that it can be used to combat crown fires (those that spread through treetops) as well as ground fires. . . . . The machine is capable of throwing soil a distance of 50 feet or to a height of 25 feet. It has a capacity for delivering 2 to 4 cubic yards per minute in a steady 70-mph stream. It is also equipped with hydraulic controls to change the trajectory and direction of the soil being thrown. It operates by digging its own supply of dirt or sand. This in turn leaves a shallow trench about 2 feet wide which may serve as a valuable fire barrier. . . . . For digging the trench and throwing the soil, the machine is equipped with impeller vanes that project from a 750-pound rotating disk at the rear. It is powered by a 130-hp engine. Since it requires room to maneuver, its use is expected to be limited to fire areas that are not too heavily wooded. Another thing, the soil it can use satisfactorily will be mainly loose dirt or sand. Relatively firm ground will also be important to support the machine's over-all weight of close to 3½ tons. The experimental model is undergoing minor changes as a result of recent trials. *(Continued on page 584)*

30 MILLION OF THESE JET-FORMED SPHERES IN EVERY INCH OF BEARING SURFACE!



JET PROCESS BLASTS MOLTEN ALLOY INTO UNIFORM PARTICLES . . . so small that thirty million will form a thin layer only one inch square! This sintered layer is the bearing surface of Federal-Mogul sleeve bearings.

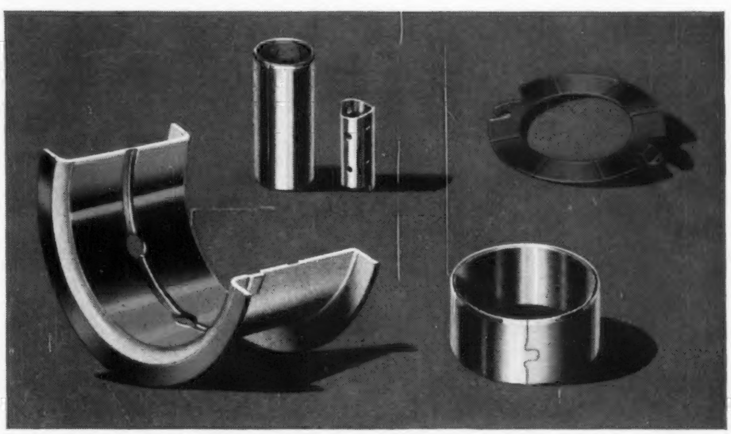
Molten copper-lead, alloyed to exact specifications, is poured into a special inert-atmosphere reaction crucible. Here it's blasted by a high-speed fluid jet to form the dense powder shown at left.

Because of the uniform particle size of this powder, the bearing surface of each F-M copper-lead sleeve bearing has precisely the same alloy composition and high adhesion to the steel backing as every other F-M bearing of the same alloy type!

YOU CAN SEE THE CONSISTENT SIZE in the photomicrograph. What you *can't* see is the consistent alloy composition which produces uniform bearing properties and performance in any alloy type.

Federal-Mogul makes engine bearings for every condition of speed and load. You can select from among five different sintered copper-lead alloys, all permanently bonded to precision-formed steel backing. Our Engineering Department is available to you for consultation or recommendations on bearing design and application. For more information, write Federal-Mogul Division, 11081 Shoemaker, Detroit 13, Michigan.

FEDERAL Mogul



A COMPLETE LINE! Steel backed bearings with a selection of many different alloys for virtually any bearing application—Plain and bimetal bushings in bronze, steel or aluminum. Precision thrust washers in solid bronze, or sintered alloys on steel (one or both faces). Rolled split spacer tubes in steel, aluminum or stainless.

FEDERAL-MOGUL

sleeve bearings
bushings-spacers
thrust washers

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC.

. . . Report to Readers *(Continued from page 582)*

FRESH WATER FROM THE SUN AND WIND

How to produce cheap fresh water in arid lands is to be investigated jointly by the agricultural engineering branch of FAO and McGill U. This cooperative effort will take the form of common projects in various selected arid and semiarid areas. Postgraduate fellowships will be offered to selected engineers from countries interested in utilizing solar and wind energy in solving their water problems. Special attention is to be given to developing smaller devices for the application of wind and sun energy, particularly in areas isolated from conventional sources of power. . . . . Production of fresh water at an economical cost is essential for raising the standard of living and for increasing agricultural production in isolated, semiarid areas where often the sun and wind are the only sources of energy available. McGill researchers have been testing several devices for purifying salt water by the use of solar energy, with the aim of greatly reducing the local cost of producing fresh water.

WEATHERING EXPOSURE TESTS OF INSULATING FIBERBOARD

A report of tests conducted by a California AES agricultural engineer reveals that ½-inch insulating fiberboard treated with penta-chlorophenol will provide a useful life up to 12 years of weathering exposure on the ground. Up to 10 years all samples used in the tests were found to be very durable, but after 12 years none was useful. . . . . The tests showed that the untreated fiberboard was about as safe as the treated material up to 10 years, which was believed to be due to the protective effect of the manufacturing process. The amounts of the chemical used ranged from 0.25 to 1.0 percent. The heavier treatments proved most beneficial during the eleventh and twelfth years. . . . . The engineer concludes that the fiberboard tested could be expected to provide satisfactory service in ordinary building construction many times as long as under the severe exposure tests he conducted.

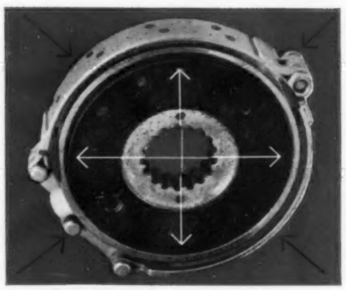
STRAW MULCH REDUCES EROSION TO A MINIMUM ON FALLOW LAND

From a recent study made at the Indiana AES by a soil scientist and an agricultural engineer of the USDA, it was found that soil erosion could be cut to a minimum by applying a wheat straw mulch of one ton per acre. Two tons of the straw stopped the erosion completely. . . . . The straw mulch was applied to freshly disked fallow soil a month after plowing. The soil was a highly permeable silt loam with a 5 percent slope. The water was applied at a constant intensity of 2½ inches per hour. . . . . This study showed that the higher applications of mulch kept the soil surface open, and that this permitted good infiltration and at the same time prevented soil washing. The smaller amounts of mulch increased infiltration only slightly; however, they significantly decreased the velocity of runoff. This, in turn, reduced the capacity of the water to erode the soil.

RAPID, ACCURATE TEST FOR RATING LIVESTOCK SHADES

A USDA-California AES research team has devised a rapid, accurate, inexpensive test for rating the heat-reducing properties of materials used to shade livestock from the sun. The test can be conducted any warm, sunny day. . . . . Shades being tested are supported by open frames four feet high. A black globe thermometer not only measures the heat intensity 18 inches beneath each shade material being tested, but it also gages the combined temperature effects of air, solar radiation, and wind. . . . . Embossed corrugated aluminum was used as a check in comparative tests with other shade materials. Of fifty materials tested, twenty-five were found more effective than the check material. A 6-inch layer of hay was found most efficient of all. Proved also effective were painted steel and aluminum sheets, painted or aluminum foil-covered fiberboard, plastic and plywood surfaces, and neoprene-coated nylon. Snow fences and translucent polyethylene film coverings were found to be less efficient.

TWIN BRAKING POWER IN A SINGLE UNIT

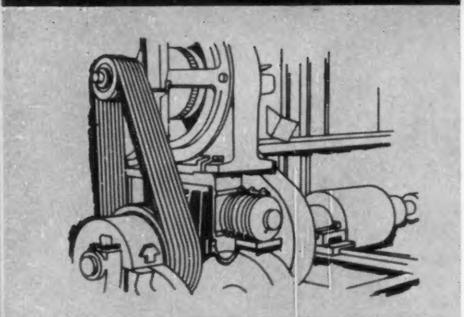


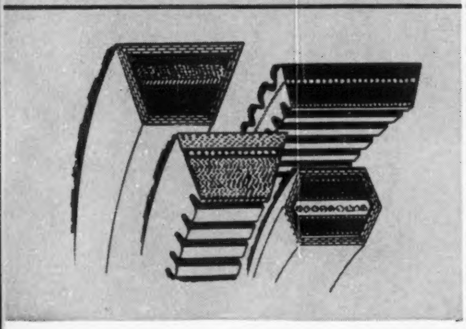
BENDIX BAND/DISC BRAKES
Now you can get the combined advantages of band and disc brakes in one compact unit—the Bendix® band/disc tractor brake. Created by Bendix—brake headquarters of the world—this newly designed brake increases torque capacity, while reducing brake size. It provides maximum lining area in minimum space; permits rapid heat dissipation. ■ For added protection and greater safety, the band/disc brake is entirely enclosed on the tractor—sealed off against dust, mud, and water. Maintenance is easy, since there are fewer parts. Adjustments are simple and external. The 7¼" x 1¼" brake can be installed on wheel or jack shaft. ■ Bendix also makes a complete line of conventional tractor brakes. For more detailed information, write us today at South Bend, Indiana.

Bendix Products Automotive Division

THE Bendix CORPORATION

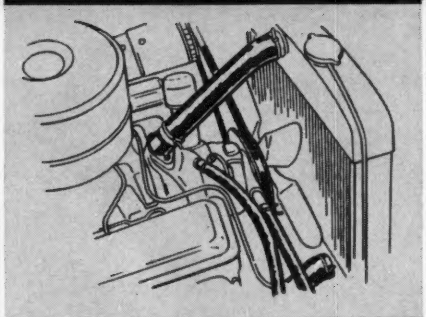
V-BELT DRIVES

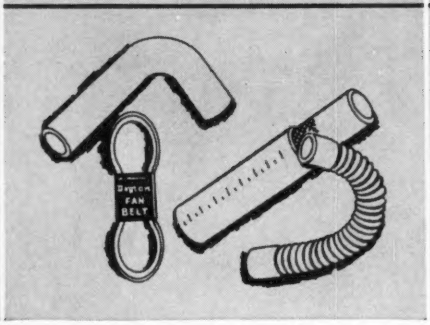




Dayco offers the only complete line of V-Belts in the industry for every power transmission need—from fractional to 1,000 and more horsepower.

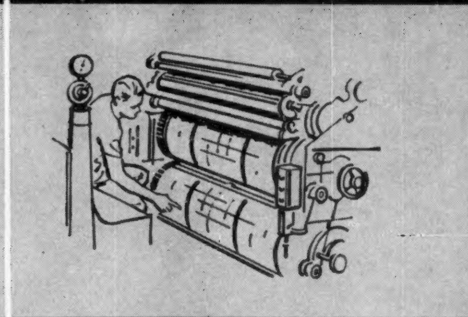
AUTOMOTIVE PRODUCTS

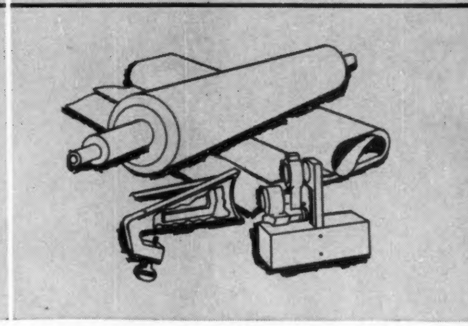




Dayco provides a complete line of Fan Belts, Radiator Hose, and other rubber products for passenger cars, trucks, busses, and tractors.

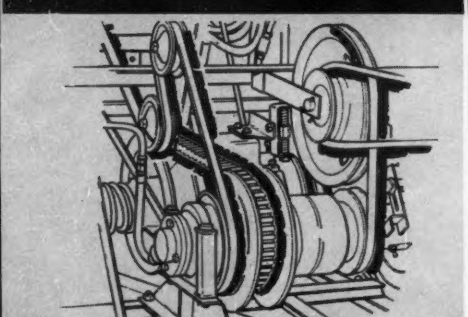
PRINTING PRODUCTS

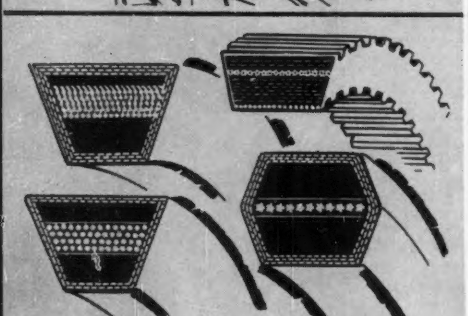




Dayco offset and letter press rollers, Gold Seal offset Blankets, Color Separators and Fountain Dividers, for all makes of presses.

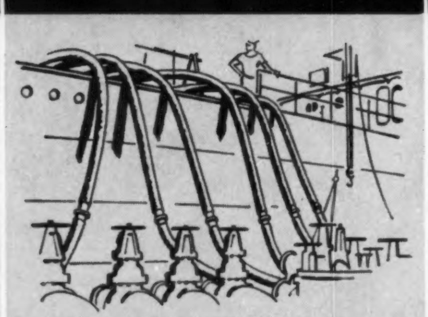
AGRICULTURAL V-BELTS

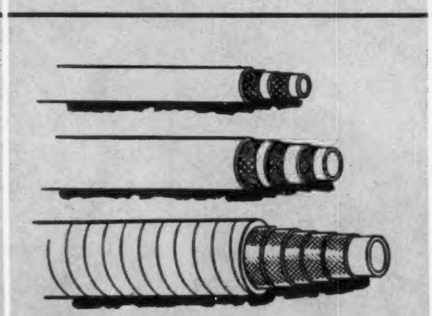




Dayco builds specialized V-Belts for the efficient transmission of power on all types of traction, propulsion and auxiliary farm implement drives.

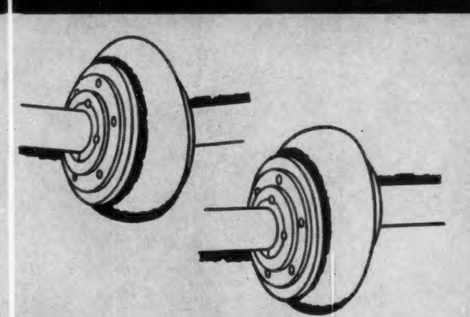
INDUSTRIAL HOSE

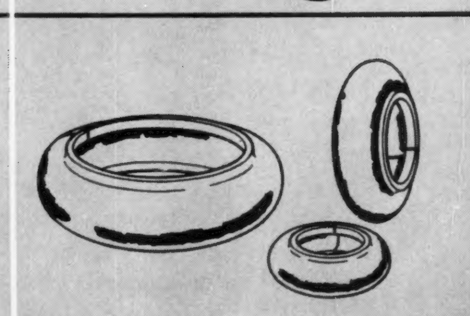




Dayco offers molded and horizontal braided, machine and hand wrapped fabric, and woven jacket constructions for all industrial applications.

MOLDED RUBBER





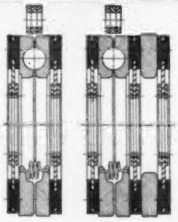
Dayco custom-engineered molded rubber, rubber-to-metal and rubber-and-fabric components for mechanical applications.

Need a special brake for a special machine?

If you're going into production on a special machine with special brake or clutch requirements, Ausco's years of experience can probably help you solve your problem. Chances are there's an Ausco production model that will suit your needs exactly, saving you the expense of new tooling.

Ausco designs are flexible...

The tables below show how torque capacity of Ausco Disc Brakes and Clutches can be increased in every size simply by adding one or more discs.



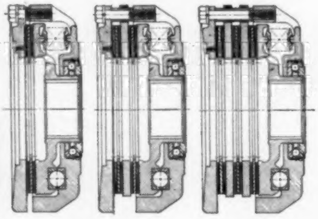
AUSCO DISC BRAKES TORQUE CAPACITY

BRAKE SIZE*	Torque capacity per brake @ 700 PSI T. L.		
	2 DISC	3 DISC	4 DISC
4 x 2	5,840	8,760	11,680
6½ x 3½	24,200	36,200	48,400
12 x 9	104,300	156,700	208,600

*Only three of eleven standard Ausco brake sizes are indicated in this table.

AUSCO DISC CLUTCH TORQUE CAPACITY

SIZE	Torque capacity at 150 RPM Shaft Speed		
	SINGLE DISC	DOUBLE DISC	TRIPLE DISC
8 x 5	12,000 lb. in.	24,000 lb. in.	36,000 lb. in.



If you have need for brakes or clutches for self-propelled equipment of any kind, consult with Ausco.

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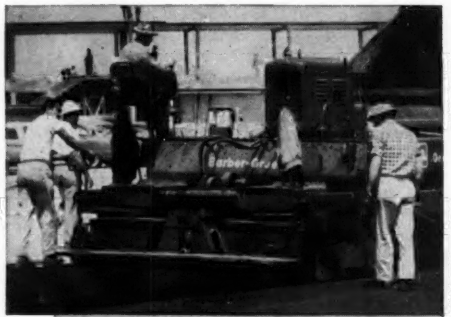
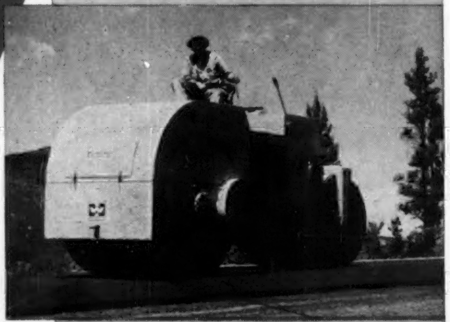


BARBER-GREENE asphalt finisher at work on Los Angeles Airport. Precision steering, braking and power control are provided by Ausco disc brakes and clutches.

GALION Roll-O-Matic road roller. Operating on the differential gear, Ausco brakes are effective on both rolls for service and parking.



HUBER-WARCO road rollers use the Ausco disc brake operating on the roller drive shaft for parking and service.

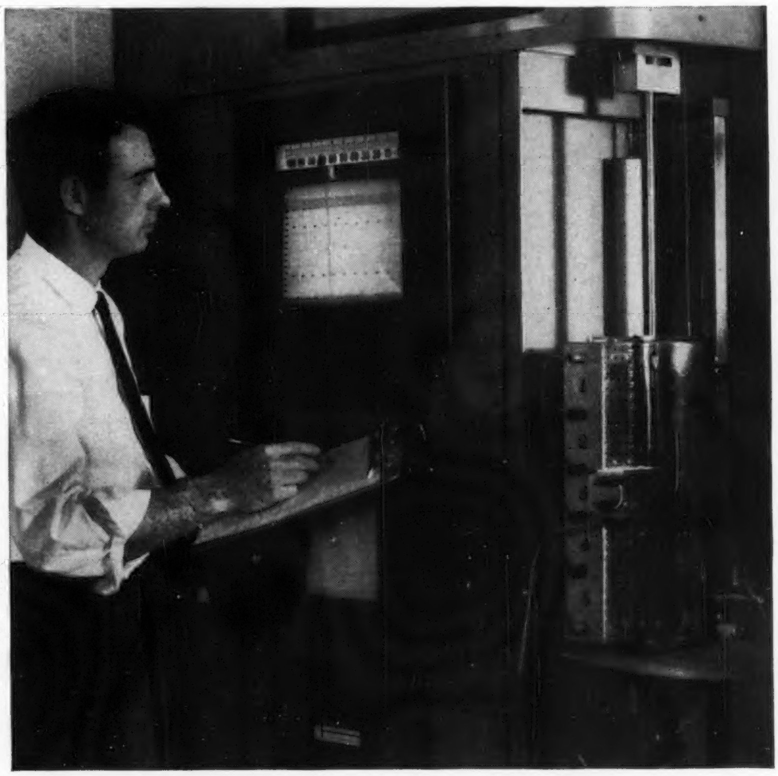
LE-ROI Tractair compressor equipped with Ausco disc brakes test drilling for gas leaks.

One in a series of technical reports by Bower

BEARING BRIEFINGS

TESTING PUTS THE HEAT ON—HELPS BEARINGS BEHAVE IN EXTREME ENVIRONMENTS

In industry today, bearing operating conditions are becoming increasingly severe. To conquer difficult environments, heat, corrosion and oxidation, Bower conducts exhaustive research to achieve improved bearing performance. One important area of Bower research, for example, is the development of special alloys to withstand extreme heat. To do this, Bower researchers use special heating apparatus to study hardness, strength and other characteristics of alloys at temperatures in excess of 1000°F.



Bower engineers study how alloys stretch as temperatures rise in excess of 1000°F., to perfect bearings that can take it.

One of the devices Bower utilizes to assure bearing precision at high temperatures is a creep tester. Bower engineers use it to load a test bar to a predetermined stress level, then, with the assistance of a special heating unit, find out precisely how much the bar stretches as temperatures are elevated to a thousand degrees F., and beyond.

With this type of data and the help of other Bower precision research equipment, engineers can determine alloys that best withstand torrid temperatures. They can also effectively mate thermal expansion characteristics of the various alloys used in roller bearing components and in shafts and housings as well. As a result of this mating, Bower creates bearings that maintain precision in the required temperature ranges and ensures bearings that provide long life, heavy load capacity and high-speed operation.

Because of Bower's continuing research in bearing alloys and other critical areas, we suggest you consider Bower to assist you with your bearing needs. Bower provides a full range of types and sizes in tapered and cylindrical roller bearings as well as in journal roller assemblies. Bower Roller Bearing Division, Detroit 14, Michigan.

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ROLLER BEARINGS

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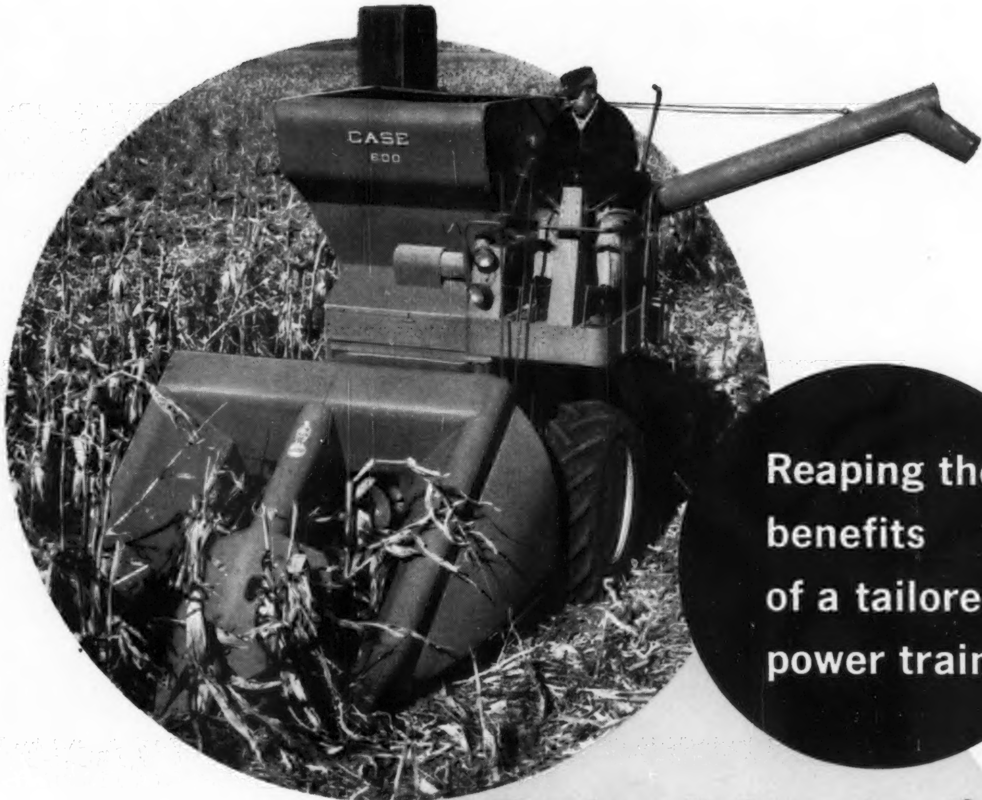
Armco can supply you with a *complete line* of steel conservation products that combine top performance with low installed cost . . . from subdrainage pipe to ditch-check sheeting. Each product, available in a wide range of sizes, gages and protective coatings, goes in fast with light equipment.

Armco Conservation Products are service-proved and are readily available throughout the United States. For complete product data and technical assistance, write **Armco Drainage & Metal Products, Inc., subsidiary of Armco Steel Corporation, 7121 Curtis Street, Middletown, Ohio.**

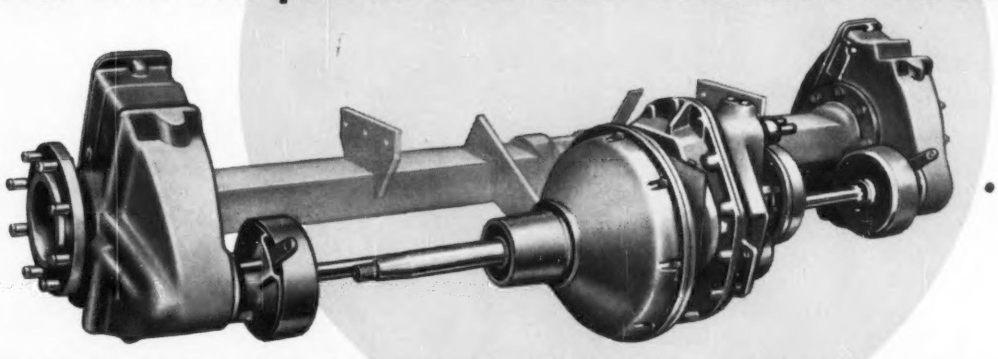
ARMCO Drainage & Metal Products



Reaping the benefits of a tailored power train

Rockwell-Standard®

Custom Drive Helps New Case "600" Combine Do Its Chores!



J. I. Case Company engineers designed the new "600" Combine with three significant advantages—big capacity, extra maneuverability and unexcelled versatility! More than ever, here is a combine engineered and built to do a remarkable job of meeting the needs of all crops and harvesting conditions.

To make sure this equipment does all its jobs well, a custom-made drive was needed. And because of their proven performance on other J. I. Case vehicle needs, Rockwell-Standard engineers were called in to work with Case planners and designers. Result of this cooperative effort was the new Rockwell-Standard TA-251 Axle. In every test to date, this specially designed driving axle has proven that it will give long, efficient, productive service—and take all the rugged usage for which the Case "600" was built.

Rockwell-Standard is the acknowledged leader in developing axles for all types of specialized vehicles. Whatever problems you have in designing and building self-propelled drives, consult Rockwell-Standard. Their specialized experience is industry-wide. It costs you nothing—and will undoubtedly offer you substantial savings in both time and money.

Another Product of...

ROCKWELL-STANDARD CORPORATION

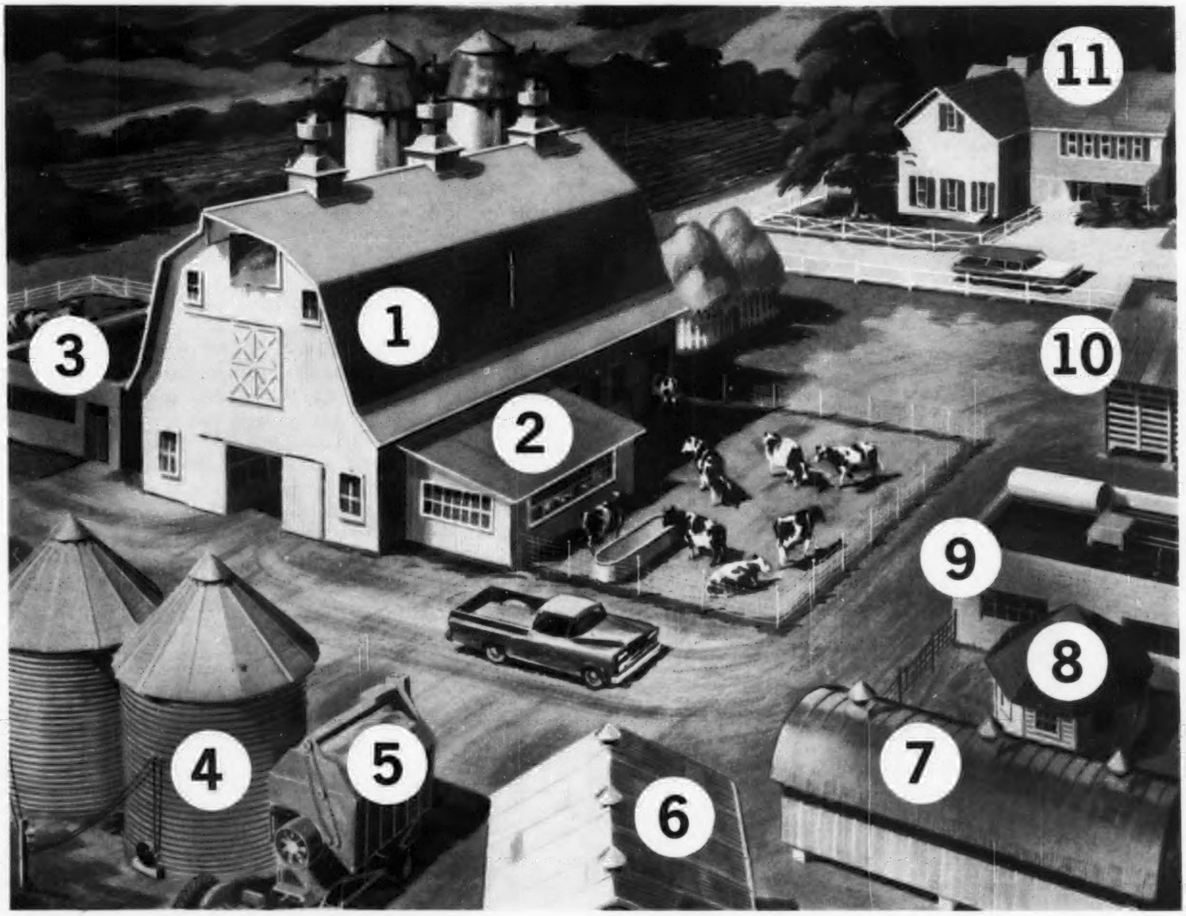
ROCKWELL R STANDARD ®

Transmission and Axle Division, Detroit 32, Michigan

Visit our Booths 90-91 at Agricultural Engineering Exposition.

Close-up of Deere unit shows Condor Flat Whipcord Belt on a separator drive and two Manhattan Agricultural Traction Drive V-Belts transmitting power from engine to wheels through a variable speed sheave.

Visit our Booth 3 at Agricultural Engineering Exposition.



How to make your 3 most important acres work harder

Honeywell automatic controls will help cut costs and increase production on your farmstead. Herds and flocks will thrive in a more healthful atmosphere. Crop drying, storage, and poultry processing will be accurately controlled and you'll work in a more comfortable environment. Get full profit from what you produce with these Honeywell automatic controls on your farm.

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MINNEAPOLIS-HONEYWELL Minneapolis 8, Minn.

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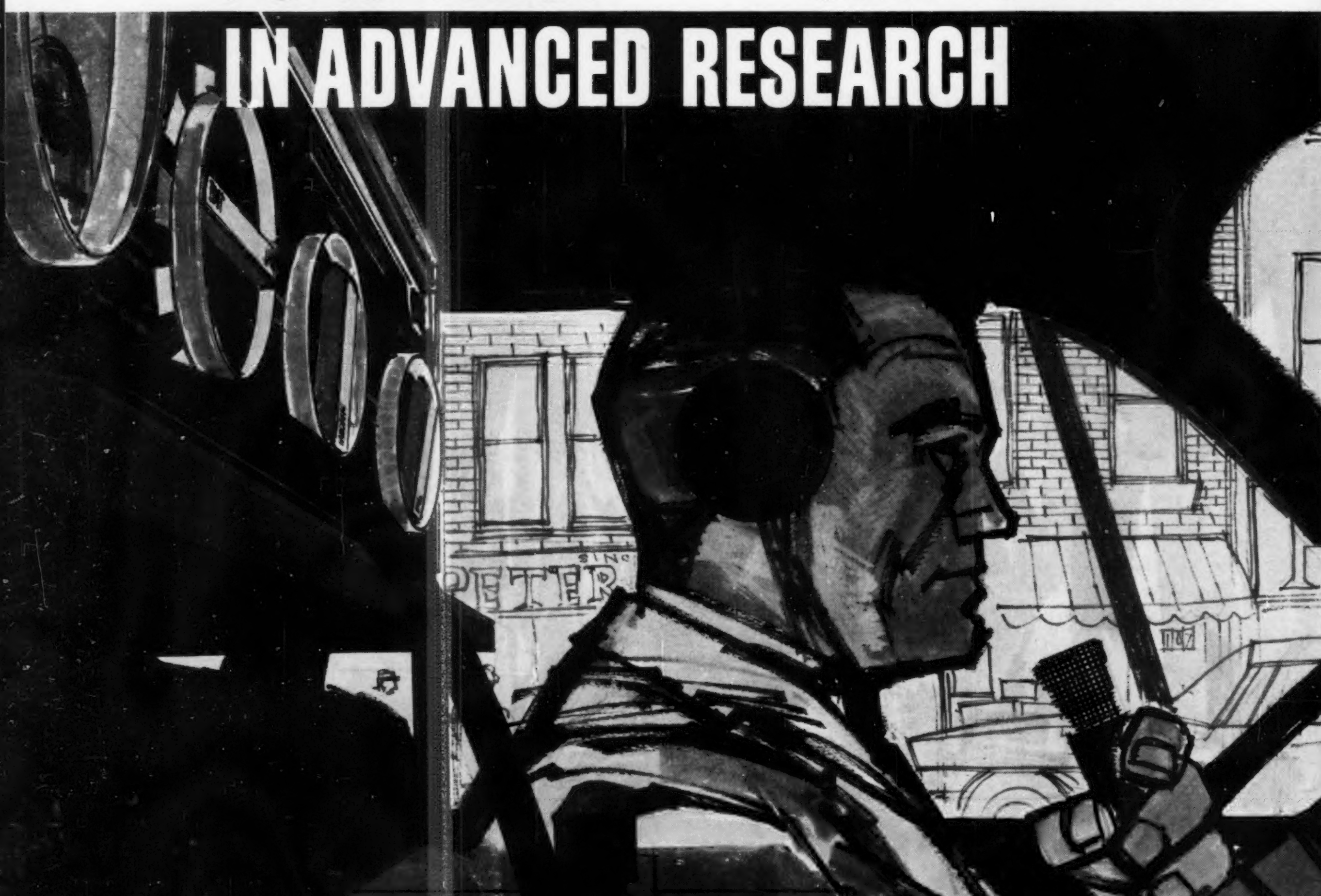

Agricultural Engineering

November 1961
Number 11
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James Basselman, *Editor*

The ASAE in Orbit

Serving agricultural engineers and agriculture in particular and humanity in general

John R. Carreker
Fellow ASAE

J. R. Carreker

Report on operation of ASAE as a national society, presented by John R. Carreker, member of ASAE Board of Directors, during Georgia Section Meeting at the University of Georgia, October 19, 1961. Title and subject treatment were adopted to general theme of meeting — Space Age and Agricultural Engineering.

EVERY planned flight into space is projected from some kind of launching pad. The launching pad that puts ASAE into orbit is the service that agricultural engineers provide for agriculture in particular and humanity in general. These engineers, individually and as a group, are dedicated to servicing their fellow man through the multitude of applications of engineering in agriculture. The solid foundation on which they built has enabled members of the profession to achieve increasingly greater accomplishments in their field with each passing year.

The fuel that projected this body into space is professional development. Forty-seven colleges and universities in the United States and Canada now offer professional curriculums in agricultural engineering. Of these, thirty-three are accredited by Engineer's Council for Professional Development. Graduates from these and related engineering institutions have entered this profession equipped with an ever-increasing degree of skill and training.

Professional development through on-the-job training and participation in ASAE activities have added greatly to the skills and accomplishments of these agricultural engineers. Technological advancements have been so rapid that "technical sterility" is practically unknown.

The Vehicle — ASAE

Taking a closer look at this body called ASAE, whose orbital course we are considering, it was launched in 1907 with 18 charter members, three of whom are still living. It has enjoyed substantial growth in the 54 years of its life.

There are several components of this vehicle we might examine in some detail. The basic structure, of course, is comprised of the individual members who are welded together in an active society and form an effective vehicle for service and professional development. These members are located in all fifty states of U.S.A., nine provinces of Canada and sixty odd other countries around the world. There are members on every continent of this globe—and it is likely that agricultural engineers will be among the first contingent of scientists to be sent to other planets, when the level of technology that requires is attained. Certainly they will be needed there to help link the engineering and biological skills needed to sustain life on those other planets. You can see that this linking of engineering and biological skills is what really sets the agricultural engineer apart from other engineers. As a group, we have a distinct advantage in this respect that should propel us onward and upward in an ever-expanding sphere of activity.

Student members and their activities constitute a vital part of this body. All of our members recognize the value and importance of these future leaders in our profession. They are encouraged to "get off on the right foot" and to recognize the value and importance of professional affiliation and what organized action through ASAE can mean to their personal development and to the enhancement of their chosen profession. Recognition by the Society of this responsibility to the student is illustrated by the degree of help given to student activities. These include—a brochure for soliciting new members, student branch manual, student member application forms, student membership cards, a student program at the Society's annual meeting, honor awards made at the annual dinner of the Society, the FEI trophy award for winning entries, certification of eligibility to transfer to member in the Society, and membership card in ASAE.

Another component of this vehicle's structure is the sections. Local, state, and regional sections of ASAE give strength to the Society as a whole. Ways are sought constantly to strengthen the ASAE regional sections, so that more members can be benefited. Ways of giving more recognition to section activities are currently being developed. We will be hearing more about this. I am proud, as you are too, that our Georgia Section of ASAE is recognized as one of the best.

Programs for the Society's national meetings are developed through five technical divisions. These are the Education and Research, Electric Power and Processing, Farm Structures, Power and Machinery, and Soil and Water Divisions. Each division has an executive committee and a larger steering committee to guide the activities in its particular field. These offices offer a highly desired area of service and influence. Programs for some sectional meetings also are developed in these technical fields. This idea might well be followed more closely in other sectional meetings, thereby strengthening their programs.

The guidance system of this ASAE vehicle includes the officers and board of directors. These include the president, president-elect, immediate past-president, three vice-presidents, and five directors. The five directors represent the five technical divisions of the Society. Major policies for the Society's advance and guidance are developed by this board of directors. It has been a revelation and a joy to me to see the dedication of self to the job given by the members of this body. They meet for long hours at the Society's two annual meetings, and they carry on extensive correspondence all year in behalf of the Society. Every issue before these directors is

(Continued on page 638)

The author — JOHN R. CARREKER — is research investigations leader for water management, Southern Branch, Soil and Water Conservation Research Division, ARS, USDA, Athens, Ga.

Fig. 1 General view of the John Deere Tractor Research and Engineering Center, which served as convenient facility for carrying out engineering program for new line of tractors

Engineering a New Line of Tractors

An example of effective team effort and cooperation

Merlin Hansen
Member ASAE

AS engineers, you are more interested in the design and development aspects of the program that preceded the introduction of the new tractors discussed in this paper than in the specific performance features which were incorporated in their design. In our industry, as a general rule, periodic design changes are made in products to achieve some specific feature of performance. Usually the desired results are secured without altering the entire vehicle. In fact, every effort is usually made to reduce changes to an absolute minimum and still achieve the desired results.

In this particular program, however, the desired results necessitated that the entire line be replaced with a completely new design concept. This approach required that the design of all tractor components be re-examined in the light of present-day circumstances. Reaching general agreement as to design objectives for this new line was a major undertaking in our over-all program. In making the study, it was recognized that a commercially successful design would have to appeal to a number of groups, each of which has certain very special requirements that must be reconciled. Further, it was also recognized that the commercial success of our new tractors would be judged by the over-all performance of the complete vehicle, and not on the basis of any single performance feature.

It is not uncommon for many engineers to believe that their principal responsibilities lie in creating machines that function with a maximum of efficiency; and in which adequate service life is assured by maintaining proper stress levels, bearing loads, etc. These goals are imperative in any present-day product, but achieving these goals alone will not insure a commercially successful product. The engineer will experience less frustration in carrying out his assignments, and he will create a much more successful product if he recognizes the need for orderly consultation with at least four separate groups and considers it a design objective to give due consideration to their requirements.

Our potential customers were the first group to be given consideration in establishing design objectives for our new tractor. They buy our products solely for the purpose of performing necessary agricultural or industrial operations. Such features as greater work capacity, more efficient performance, operator comfort, reasonable costs, reliability, ease of maintenance, and adequate parts service are always of special importance to customers. There are few industries or professions that can boast of the outstanding accomplishments that have been achieved by agricultural and mechanical engineers working cooperatively with the farmers in this field of endeavor. Mechanization of agriculture started shortly after 1800. If one of the slaves from ancient Egypt were returned to life about the time that John Deere was working on his first plow in 1837, this slave would have been very much at home as far as farming operations are concerned. There has been more advancement in efficiency of producing agricultural products during the past 50 years than in all previously recorded history. Our new tractors, we believe, represent another step in this trend. They have about 25 percent more useable power per pound of vehicle than the older models, with a resulting increase in work capacity.

Manufacturers who produce implements or equipment that would be used with our new tractors were the second group to be recognized in our new tractor program. It was considered desirable to make their products also more popular with the trade. Features of special interest to this group include:

(a) Adequate versatility and capacity in the hydraulic system

(b) Adequate implement and crop clearances where needed

(c) Adequate power transmitting capacity through the PTO drive

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Paper presented at a meeting of the Pacific Coast Section of the American Society of Agricultural Engineers at Davis, Calif., March 1961.

The author — MERLIN HANSEN — is chief engineer of new products, John Deere Tractor Research and Engineering Center, Deere and Company, Waterloo, Iowa.

Acknowledgment: The author acknowledges the cooperation of his colleagues in the many subsidiaries of Deere and Company, and especially those at the John Deere Tractor Research and Engineering Center, without whose assistance this paper would not have been possible.

Fig. 2 Inside facilities at the Research and Engineering Center provide for several testing procedures: *(Left)* procedure for measuring tipping angles of a tractor; *(center)* cold room; and *(right)* dynamometer control panel and oscillograph for engine testing

(d) Proper performance in the hitch system

(e) Adequate and conveniently located points of attachment for agricultural implements and industrial equipment, and similarity in positioning the various attaching points and surfaces to permit attaching a machine to more than one tractor model

(f) Conformity to industry standards so that implements may be used successfully with all tractors likely to be found in field service.

Our company's marketing division was the third group to receive recognition in our program. We recognize that all products in this day and age must be *sold* to prospective customers. Features of particular importance to this group include:

(a) An ample selection of options to allow them to present products which are properly equipped for meeting the many local circumstances that they find

(b) A striking and distinctive appearance

(c) Good "family" resemblance and similarity throughout the line. It is always frustrating to a salesman if the various models embrace dissimilar design features unless there are obvious reasons for such deviations.

The production people, who would be responsible for producing the new tractors, constituted the fourth group to receive consideration in our program. Features of particular importance to this group include:

(a) Keeping the number of sizes or models of machines to a minimum

(b) Providing for the maximum economical use of common parts throughout the line

(c) Providing sufficient similarity in those dissimilar parts to permit such parts to be produced on common manufacturing equipment

(d) Recognizing the manufacturing skills that may be present in the manufacturing organization, and, where possible, avoiding the need for special skills not presently available.

Having established the groups that would eventually approve or reject our new designs, as well as the general features of particular interest to each group, three important steps remained, as follows:

1 Transmitting the basic objectives as previously described into engineering specifications, from which designers could proceed with the design of the individual tractor models. This task was performed by our engineering staff members consulting with executives, who in turn were familiar with requirements dictated by each of these four groups.

2 Organizing an engineering staff consisting of research, design, development, cost, specifications, experimental laboratory, and field testing personnel; and, in addition, building a physical plant capable of housing such an engineering project.

3 Creating the actual design for each new tractor model, fabricating experimental samples, carrying out the required laboratory and field-testing programs, making necessary design revisions to correct deficiencies uncovered as a result of such tests, retesting revised designs, completing cost studies, and making necessary design changes dictated by these cost studies. Finally, after satisfactory levels of performance and costs were achieved, releasing the design to the tractor factories for production.

The physical plant necessary to carry out an engineering program of this magnitude may be of interest. The John Deere Tractor Research and Engineering Center was built in 1955 and 1956, and its first assignment was to carry out the engineering program on a new line of tractors. At present our facilities consist of the following:

(a) A staff of slightly over 400 people of which about 31 percent are engineers, about 18 percent are draftsmen and technicians, about 12 percent are clerical help, and about 39 percent comprise our shop and field personnel (machinists, pattern makers, dynamometer operators, mechanics and tractor operators).

(b) A tract of 860 acres of land of which about 700 acres are devoted to the production of actual farm crops. Experimental and production machines are used to perform this work.

(c) Office, shop, and laboratory space totaling about 82,500 square feet (Fig. 1) with the necessary auxiliary services such as an electrical power substation, a sewage-disposal system, a water supply, etc.

(d) The following design and testing facilities: digital computer, essential in the design of cams, gears, shafts, balancers, etc.; experimental machine shop, parts inspection

. . . Tractor Engineering

area, and parts storage area; experimental pattern and model shop; assembly floor; miscellaneous test area; cold room; engine test cells; transmission and PTO durability test stands; durability test tracks; drawbar test track; torture track; mud bath, and instrument truck.

Space does not permit a detailed discussion of all performance features incorporated in the new John Deere tractors; however, there are four basic features that should be of particular interest to agricultural engineers, and that warrant the following discussion:

Increased Power Per Pound of Vehicle Weight

The power per pound of vehicle weight was increased approximately 25 percent. The effective use of this power requires modest increases in travel speeds. As an example, four-bottom plows traveling at 5 mph cover the same area as five-bottom plows traveling at 4 mph. This approach appears desirable because *(a)* soil compaction problems discourage heavier vehicles, and *(b)* limited space available between usual row crops discourages massive vehicles. These factors practically prohibit increasing the size and weight of the vehicle in proportion to horsepower increases. Therefore, work capacity should be measured in terms of acres per hour covered, not in terms of total number of plow bottoms or feet of tool bar.

Use of Internal Implements

The use of three-point hitch mounted implements provides for transferring substantial amounts of weight from the implement to the tractor, thereby increasing its tractive capacity without resorting to excessive amounts of ballast. Figs. 4 and 5 illustrate this point. The improvements in the hitch and hydraulic systems that were incorporated in our new tractors resulted in good field performance with substantially larger hitch-mounted implements than we have heretofore found practical.

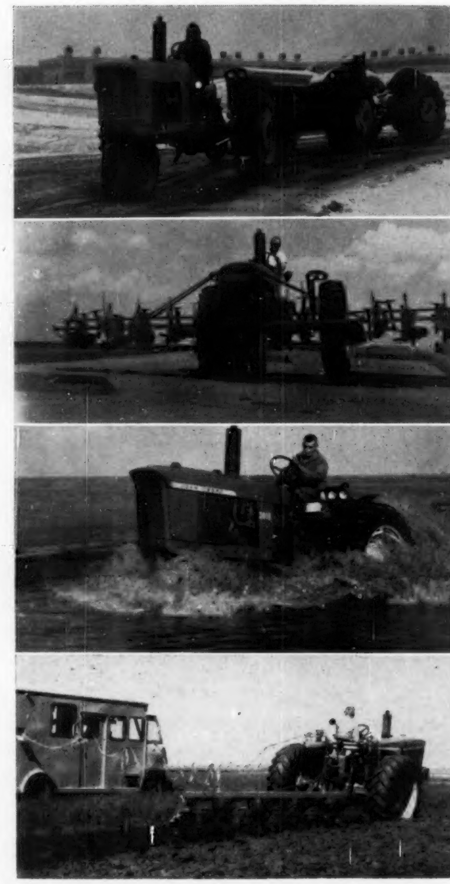


Fig. 3 Several durability and torture tests are conducted out-of-doors: From top to bottom are all-weather durability test; tractor with 6-row cultivator on torture track; tractor in mud and water both; and instrument truck and tractor with five-bottom plow

Provision for Transmitting More Power Through the PTO Drive

All tractors are offered without a PTO drive and with an independent, dual-speed 540-1000 rpm design. The dual-speed PTO drive conforms to the ASAE standards for each speed. The design is such that the 6-spline outlet runs at 540 rpm, and the 21-spline outlet runs at 1000 rpm; and this relationship is accomplished without requiring the operator to make a selection of a gearshift lever position. In each design, there are fewer gears transmitting power to the 1000-rpm outlet than to the 540-rpm outlet; therefore, the 1000-rpm outlet can be considered to be the more direct, and consequently the more efficient of the two drives. It is also pointed out that the Model 4010 Series tractor is designed to develop 70 hp at the PTO outlet. At 540 rpm and without allowances for instantaneous fluctuations in torque (which are seldom less than 50 percent of the total for most implement and tractor combinations), the average torque transmitted by the PTO is 8170 lb-in. With reasonable allowances for instantaneous torsional fluctuations, this figure may often increase to approximately 10000 lb-in. which is certainly well above the existing industry allowance of 7500 lb-in. for the 1⅜-diameter PTO outlet as defined

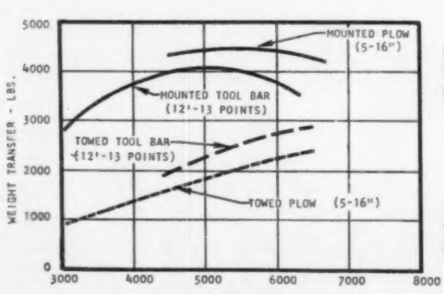
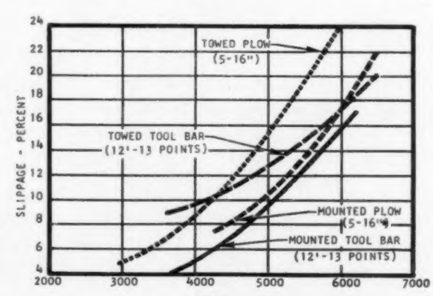


Fig. 4 *(left)* Weight transfer-hitch-mounted vs. towed implements (John Deere 4010 tractor)

Fig. 5 *(right)* Wheel slippage for hitch-mounted versus towed implements (John Deere 4010 tractor)



in ASAE recommendations. Transmitting this same amount of power at 1000 rpm results in an average torque of 4412 lb-in., and with a similar allowance for instantaneous torsional fluctuations, the value is still less than 5500 lb-in. This simple arithmetic certainly reveals that the implements which are capable of absorbing the full 70 horsepower available at the PTO outlet on this tractor must operate at the 1000-rpm speed, or else industry standards relative to loads on the PTO drive will be substantially exceeded. Therefore, all manufacturers of implements in this classification are urged to fit their machines for the 1000-rpm PTO operating speed.

Variable-Speed Engine Operation

There is considerable confusion as to what is actually meant by "variable-speed engine operation," and what specific performance features are secured from this provision. Also, variable-speed engines by themselves do not necessarily achieve the desired results in the complete vehicle. Other components in the vehicle must be designed to take advantage of the variable-speed engine if desired over-all performance results are to be secured. We have defined our "variable-speed engine operation" as follows in our engineering-design objectives:

(a) On 1010 and 2010 sizes:

Minimum operating engine speed for light load service: 600 rpm.

Operating engine speed range for full load service: 1500-2500 rpm.

Engine speed for standard PTO operation: 1900 rpm.

(b) On 3010 and 4010 sizes:

Minimum operating engine speed for light load service: 600 rpm.

Operating engine speed range for full load service: 1500-2200 rpm.

Engine speed for standard PTO operation: 1900 rpm.

Maximum full-throttle speed for transport conditions: 2500 rpm. (This is equivalent to 2750 rpm at no load.)

The reasons for variable-speed engine operation, as incorporated in our new line, are as follows:

(a) Any desired travel speed between the regular transmission steps can be achieved.

(b) It permits slower and faster travel speeds than can be achieved with a single engine speed. (600 rpm and first speed is 0.48 mph, while 2500 rpm and eighth speed is 18.77 mph.)

(c) It permits the operator to match the tractor to the desired work from the standpoint of power by proper selection of a gear ratio and engine operating speed, thereby saving fuel for the light loads as compared to a single operating speed. This results in substantial fuel savings for light load operation. Fig. 6 shows representative savings.

(d) When high limit power requirements are not required, the engine can be throttled to lower speeds which makes the tractor much more pleasant to operate.

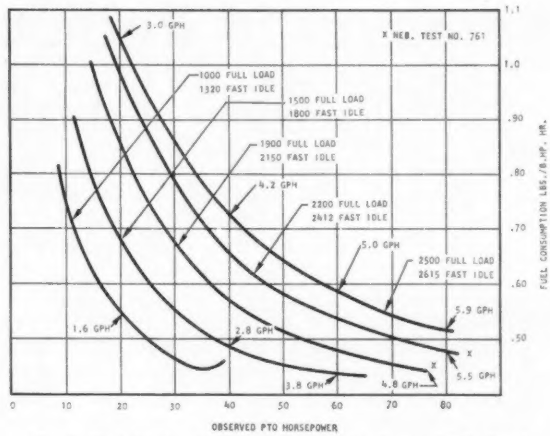


Fig. 6 Variable-load characteristic (John Deere 4010 diesel tractor)

These four operating advantages cannot be entirely realized when the tractor is used to pull PTO-driven implements which require exact PTO operating speeds. Since most PTO-driven implements do not require the maximum horsepower output of the tractor, we elected to establish transmission gearing which provided for standard PTO operating speeds somewhat below the maximum operating speed of the engine. The design provisions that had to be incorporated in the tractor so that the customer could take advantage of this "variable speed" feature include:

(a) Properly spaced transmission operating speeds giving due consideration to the engine operating speed limitations.

(b) Hand throttle, foot feed, and governor performances that provide for the various speed ranges. This includes over-ridable throttle stops at the significant speeds.

(c) Tachometer dials which define proper operating conditions such as the correct PTO speed, the normal operating speed range, the maximum speed for transport, etc.

(d) Provision for keeping tractor and engine vibration within proper limits throughout the specified variable-speed range.

(e) Engine characteristics which insure proper engine performance throughout the specified variable-speed range.

From the foregoing discussion, it will be noted that the need for the engineer to enlist the cooperation and advice of others in establishing design objectives for new products have been stressed. It still remains his responsibility to execute the design objectives effectively and economically. This paper reveals that our engineering staff not only had to work with other groups, but that it had to function effectively within the group. Engineering a modern product is definitely a "team effort" of many individuals and groups; and only with good team cooperation can any large engineering program give promise of success.

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2 Hansen, Merlin. John Deere's new line of tractors. SAE Paper 225B, September 1960.

Removal of Radioactive Fallout from Farm Land

Progress Report Number I

R. G. Menzel and P. E. James
Member ASAE

THE possibility of warfare with nuclear weapons impels attention to a serious problem that would result therefrom, namely, the decontamination of agricultural land. Fallout of radioactive fissionable products from nuclear weapons or reactor explosions might contaminate many square miles so that produce from the land would be unacceptable. These areas would need to be decontaminated before normal agriculture could be resumed.

In 1958, two experiments on the physical removal of radioactive surface contamination were conducted at the USDA Agricultural Research Center at Beltsville, Md. In the first experiment, contaminated sod, standing crops, and straw mulches were removed. The sod was removed with a sod cutter. The standing crops were Sudan grass and soybeans about 12 in. tall. Both crops were cut with a mower, then with a forage chopper. The straw mulch was applied at rates of 2, 5, or 10 tons per acre and was removed with a side-delivery rake. In the second experiment, contaminated surface soil was removed from fields of Elkton silt loam and Sassafras sandy loam. The surface soil was removed with a road grader. Prior to contamination, different plots of soil were prepared as plowed land, disked land, and seedbed. After contamination, rolling and applications of asphalt were tested to see whether or not they would improve the removal of contamination with the road grader.

The following field equipment was used to conduct these experiments:

- Tractors
- Radioisotope sprayer with field-type herbicide spray nozzles set 20 in. apart on a boom (Fig. 1)
- Air compressor, driven by gasoline engine
- Sod cutter, 12 in. wide
- Mower with aluminum basket attached to cutter bar (Fig. 2)
- Flail-type field forage chopper
- Side-delivery rake
- Plow
- Disk harrow
- Section harrow

Condensed version of paper presented at the Annual Meeting of the American Society of Agricultural Engineers at Ithaca, N. Y., June 1959, on a program arranged by the Power and Machinery Division.

The authors — R. G. Menzel and P. E. James — are, respectively, soil scientist and agricultural engineer, Agricultural Research Service, USDA, Beltsville, Md.

Acknowledgment: The authors acknowledge the helpful cooperation of R. F. Reitemeier, W. M. Carleton, W. C. Hulburt, Howard Roberts, Jr., Marvin Johnson, and E. L. Cox in planning and evaluating this study. Appreciation is expressed for the loan of field equipment during the study by Massey-Ferguson Co. The work reported in this paper was supported by funds from the Atomic Energy Commission.

For detailed description of test procedures and a discussion of results, refer to ASAE Paper No. 59-124, copies of which may be obtained from the American Society of Agricultural Engineers, St. Joseph, Mich. (Price, 50 cents per copy or ASAE member order form.)

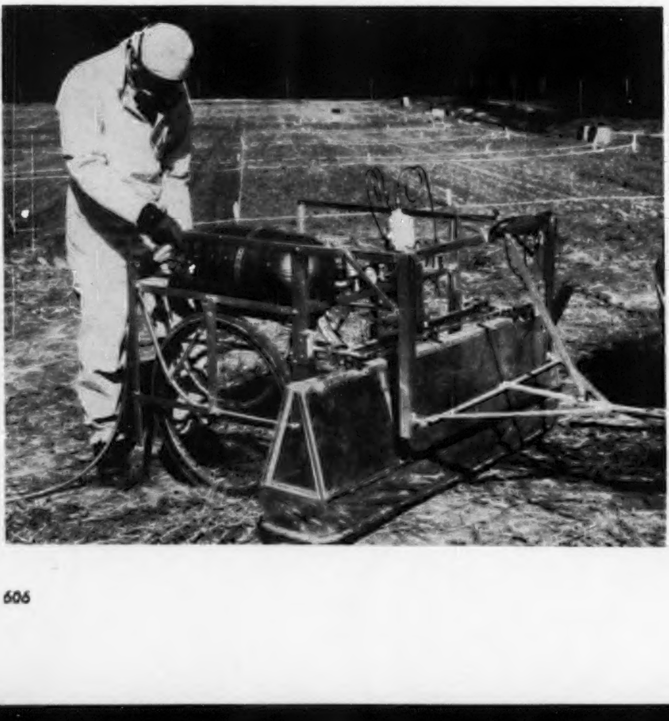

Fig. 1 *(Left)* Sprayer used to apply radioactive solutions to land surfaces

Fig. 2 *(Below)* Aluminum basket for attaching to cutter bar of mower

TABLE 1. PERCENTAGE OF DECONTAMINATION BY REMOVAL OF CROPS AND MULCHES

Treatment	Percentage Ba-140 removed
Raking mulch, 10 T/A	100
Raking mulch, 5 T/A	97
Raking mulch, 2 T/A	94
Cutting and removing sod	94
Flail chopping soybeans and some soil, after mowing	89
Flail chopping Sudan grass and some soil, after mowing	60
Mowing soybeans	37
Mowing Sudan grass	29

Sidewalk roller, 2½ tons, 2 ft wide
Corrugated roller
Asphalt sprayer mounted on tractor (Fig. 3)
Road grader with blade 7 ft wide.

Radioactive contamination was applied in solution as a spray. The contaminating material applied per square foot of plot area was 0.6 microcuries of barium 140 in the first experiment and 20 microcuries of phosphorus 32 in the second experiment. Decontamination operations were carried out within two days and before rainfall or appreciable wind action occurred. The amounts of radioactive materials on the surfaces before and after decontamination were calculated from the radioactivity of surface soil samples.

The percentages of decontamination achieved by removal of crops and mulches are given in Table 1. Decontamination by removal of surface mulches was quite effective. (More recent tests with dry application of simulated fallout, followed by sprinkler irrigation, have shown only 50 percent decontamination with five tons of mulch per acre.) Removal of sod was quite effective, as would be expected. Removal of standing crops was rather ineffective. An attempt was made to pick up a thin layer of surface soil with the flail chopper. This proved to be very difficult as the fan quickly clogged. The rapidly moving flails also caused a great deal of radioactive dust (Fig. 4).

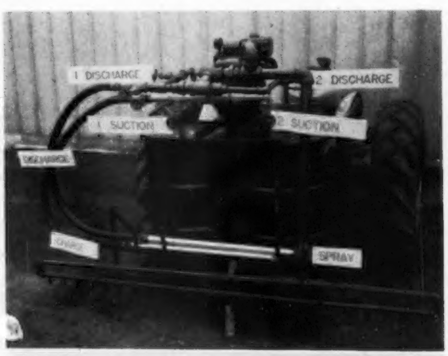

Fig. 3 *(Top)* Sprayer used to apply asphalt emulsion to soil surface • Fig. 4 *(Bottom)* Dust from a flail-type forage chopper

The average percentages of decontamination achieved by scraping bare soil ranged from 60 to 100 (Table 2). Soil prepared as a seedbed was usually more effectively decontaminated than the rougher soil surfaces, but this difference reached the 70 percent level of statistical significance on Elkton silt loam only. Rollers were used to smooth the rougher surfaces after contamination and before scraping. The sidewalk roller used on Sassafras sandy loam was unsatisfactory because it tipped easily, placing radioactivity at uneven depths. Decontamination was significantly poorer following its use. The corrugated roller used on Elkton silt loam improved decontamination, but the effect did not quite reach the 95 percent level of statistical significance.

Some of the plots were sprayed with asphalt-water emulsion at the rate of one gallon per square yard. The asphalt broke in scraping and had little effect on the removal of contamination.

Two cuts with the grader removed significantly more radioactivity than one cut. Each cut with the grader removed about 2 in. of the Sassafras sandy loam when not rolled and ⅝ in. when rolled. On Elkton silt loam each cut removed about 1⅜ in. when not rolled and 1⅛ in. when rolled.

TABLE 2. PERCENTAGE OF DECONTAMINATION BY SCRAPING SURFACE SOIL FOLLOWING VARIOUS TREATMENTS

Number of cuts with grader	Asphalt spray	Soil preparation: Plowed, Rolled	Plowed, Not rolled	Disked, Rolled	Disked, Not rolled	Seedbed, Rolled	Seedbed, Not rolled
		Sassafras sandy loam					
1	Yes	75	96	66	70	82	99
1	No	85	68	60	80	62	100
2	No	89	100	95	100	93	100
		Elkton silt loam					
1	Yes	91	69	88	89	99	92
1	No	98	84	91	91	94	96
2	No	87	91	100	86	100	100

Progress Report Number II, based on ASAE Paper No. 61-229 presented during the 54th Annual Meeting of ASAE in June 1961 at Ames, Iowa, will be published in the December issue.

1961 TRANSACTIONS of the ASAE

THE General Edition of the 1961 TRANSACTIONS of the ASAE, Vol. 4, No. 1, containing 152 pages is off the press. Copies are available at $6.00 each ($3.25 to ASAE members). The second edition, containing at least 96 pages, will be a special edition devoted to technical articles on Power and Machinery subjects and will be published in December. Copies of the special edition will sell for $4.00 each ($3.00 to ASAE members). Combined price for both editions is $8.00 ($5.50 to ASAE members).

Automation Near in Irrigation

Knowledge and equipment to mechanize now available

Claude H. Pair
Member ASAE

"AUTOMATION" is a term applied to those factories or processes which have reduced or eliminated human labor in their operation and are producing products with high efficiency and close product control. Many products ranging from steel to radios are being produced under these conditions. At present automation is most highly developed in those factories manufacturing chemicals, petroleum, and foods. In the space of one generation our food production has progressed from a maximum use of manual labor through the so-called horse-and-buggy days to the use of modern gasoline and diesel tractors with their accompanying farm implements that today permit one man to do the work of five or more men on the modern farm. We do not have complete automation in the planting and harvesting of our crops, but we have advanced a long way toward that goal.

Looking at irrigation, it changed little over the centuries until after World War II. Since the mechanization of other farm tasks has been accomplished, many farmers are now looking at irrigation with the idea of reducing the amount of labor needed. We still have hundreds of thousand acres of furrow or corrugation irrigation using the same old sod, gravel, or other diversion structures made on the spot by that symbol of irrigation — the man with the shovel. We have progressed from digging most of our farm laterals by hand to forming them with machinery. Siphon tubes are replacing the cut ditch banks and have eliminated many washed-out ditches. The canvas dam or portable metal dam has replaced the shovelled sod dam in the field lateral as a means of diverting water, but the need for much manual labor in irrigating still remains. Today's farmers are asking the colleges, U.S. Department of Agriculture research agencies, and equipment manufacturers to devise ways and means for eliminating much of this labor. In other words, they are saying, "Bring us automation in irrigation."

This paper discusses some of the problems involved, the present-day labor-saving devices, and the future possibilities for automation in irrigation.

The basic problems that have to be solved by the farmer and engineer in this mechanization are the old stand-by problems of when to irrigate, how much water to apply at an irrigation, and the best method to use in applying this water.

The problem of when to irrigate still involves many unanswered questions. The factors to take into consideration in making this decision are the crop and stage of crop growth, root zone depth, water-holding capacity of the soil in the root zone depth, soil moisture stress level for high-quality crop production, and weather.

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The research scientists in the agricultural colleges and universities, together with those of the USDA Agricultural Research Service, are studying the root development and the water use of various crops at all stages of plant development on various soils and under various weather conditions. Also, some work is being done on the problem of soil moisture stress levels for high-quality crop production. Much more work needs to be done.

At the present time there are three general methods for determining when to apply water for irrigation. The one most widely used is the color of the crop and the feel of the soil. The second is the calendar method. A few irrigators are using soil moisture measuring devices to indicate when to irrigate.

Some of the soil moisture measuring equipment formerly used in the laboratory is being manufactured and sold to assist the irrigator in deciding when to apply water. These instruments are of the soil moisture block, tensiometer, or neutron moisture meter types.

Automatic equipment for starting the flow of water to the field distribution system is being used on some farms. Time clocks activate motor-control equipment to start pumping plants; then at a preset time, to energize electric or hydraulic-control valves to turn on or shut off water in pipelines. Clocks close some gates and open others to change water flow from one field to another. Some of these devices are completely automatic in their operation while others have to be reset after each irrigation.

We have made some progress in developing automatic equipment for measuring soil moisture and starting our irrigation, but if we are to integrate the type of crop, stage of crop growth, root zone depth, water-holding capacity of the soil in the root zone depth, desired soil moisture stress level and weather, we will need some form of electronic computer which can evaluate each of these factors and its effect on the other factors to arrive at the exact soil moisture level when water should be applied to the field. This computer will then be triggered by a soil moisture measuring device when this moisture level has been reached. The water will then be turned into the field distribution system at the exact time it is needed.

The second problem in the mechanization of our irrigation system is to determine when the amount of water needed for an irrigation has been applied. The factors involved in this problem are the same as the ones listed under the problem of determining when to irrigate with the addition of the soil intake rate. A few modern irrigators use a probe or shovel to determine when the right amount of water has been applied, but the majority of irrigators use the clock method.

Appearing on the irrigation equipment market are a few devices for determining when the correct amount of moisture has been added to the soil. These operate on either the time clock, resistance block or tensiometer prin-

Fig. 1 Lateral and border gates controlled by time clock. ***(Left)*** **Lateral gate open and border gate closed.** ***(Right)*** **Lateral gate closed and border gate open, after being triggered by clock.**

ciple. One of these automatic devices has been described as containing a soil moisture probe, a transistor amplifier, a control for selection of the desired moisture percentage, and a clock. In operation, the probe is inserted in the soil and a solenoid valve in the water supply line. A dial is set for the desired wet level of soil moisture and a second dial is set to the desired dry level. When the soil moisture is reduced to the dry level by the growing crop, the irrigation system is turned on. When the soil moisture in the area of the probe reaches the wet limit set on the dial, the system is shut off. The clock attached to this automatic irrigation-control device permits selection of the time during the day the system is allowed to operate should that time be different than determined by crop and soil needs.

The equipment described above is a beginning for determining when to irrigate and when the correct amount of water has been applied by an irrigation system, but it is subject to the same errors that affect soil moisture measuring blocks and tensiometers when used to measure the moisture level in the soil. Also, the soil varies over the field so that more than one installation of equipment would be needed. Future automatic controls for determining when to irrigate and when the correct amount of irrigation water has been applied to a field may use a perfected neutron moisture meter at several locations activating radio-controlled relays causing automatic valves or gates to operate, shutting off the irrigation water and switching it to another field when the field being irrigated has received sufficient water. There must be considerable improvement in present soil moisture measuring equipment before this control could be used for all soil types.

After determining when to irrigate and how much water to apply, the next problem is the actual application of the irrigation water to the farm field. Most irrigation methods can be classified under the surface, subsurface, and sprinkler types. Each method of water application is adopted to a particular set of cropping, soil, topography, and weather conditions, although there are some areas where the conditions do not favor any particular method. The needed equipment for automation will vary according to the method of irrigation.

The surface-type irrigation system usually has the water delivered from the irrigation source to the farm lateral from which it flows into the field lateral and is delivered to the individual border, furrow, corrugation or basin for distribution on the field. The farm and field laterals may be open ditches or pipelines. Water-control devices are usually gates and check dams in the open ditches and valves or slide gates in the pipelines. The most commonly used method of diverting water from open field laterals is the use of canvas or portable metal dams to pond the water, and then use siphon tubes to get the water from the open field lateral into the individual furrow, corrugation, border or check. Those surface systems having field laterals of buried pipelines distribute the water through valves (hydrants), or gated pipe into the individual border strip, furrow, corrugation or check.

At a few locations, mainly in the western part of the United States, there are border irrigation systems having field lateral controls consisting of clock-controlled check dams that automatically drop a gate or canvas. This changes the water from one border to the next at preset times. Fig. 1 shows equipment for doing this. Fields having this labor-saving device installed have had very precise land preparation so that uniform water distribution between border strips is obtained. The more labor-saving devices used in irrigation, the better land preparation and irrigation system design that will be required of the farmer, contractor, and engineer to effectively utilize these devices.

The surface-type irrigation system of the future using a minimum of labor in water application will consist of a pushbutton system of motor-controlled gates or valves to divide the water in the farm lateral with a system of automatically controlled dams in the field lateral so that when a predetermined quantity of water is admitted into a group of borders, furrows, corrugations, or basins, the first field lateral dam would open, and a second group of borders, furrows, corrugations, or basins would be irrigated. This process would be repeated until the whole field and eventually the farm has been irrigated.

Subsurface irrigation is limited to locations with ideal soils, water supply, and cropping patterns suited to this labor-saving method of irrigation. It needs automatic gates to control the water level in the open-ditch type and automatic valves to control the water level in the closed drain. These gates and valves would be controlled from the automatic soil moisture measuring equipment in the fields being irrigated.

Most effort has been expended on sprinkler irrigation to achieve automation, and the Utopian goal of all irrigators, applying water to the land with a minimum of labor, has come closest to realization with the use of this system.

Most sprinkler systems are portable or semipermanent having hand-moved laterals. It was soon recognized that moving the portable laterals would have to be mechanized, so the side-roll sprinkler system was developed, and later

powered by a small gasoline engine. Other sprinkler systems under the name of pull wheel, drag, and giant sprinkler systems were developed. These all reduced the manual labor involved in moving sprinkler irrigation equipment, but the development of the self-propelled and solid systems removed the large labor requirements from sprinkler irrigation. Among these self-propelled types is the system having the sprinkler lateral mounted on a system of A frames with the wheels hydraulically powered. This lateral rotates around the water source at an adjustable rate of speed to irrigate a circular area of 160 acres or more. No labor is needed except to start, stop, and service this sprinkler system.

This year for the first time, a self-propelled irrigation machine mounted on tractor treads and consisting of a 1100-gpm pump, two giant part-circle sprinklers, and a butane engine, was introduced into the southern Idaho irrigated area (Fig. 2). This machine takes water from open ditches, spaced every 330 ft through the field, and sprinkles half the area between the field laterals. The machine straddling the field lateral and pulling its portable dam behind it, travels one mile in 20 hours down the ditch unattended. At the end of the lateral the irrigator drives the machine 330 ft to the next lateral and starts it back up the field. The engine on this machine was protected by a pressure switch and heat-control switch that stopped the engine if trouble developed. The machine is another step forward in the reduction of manual labor in irrigating.

The solid system has a sprinkler set at every sprinkler location over the field. At first these sprinklers were operated in solid blocks with the number of sprinklers operating at one time depending upon the number of laterals, the number of sprinklers on the lateral and the quantity of water available. This has been modified by the development of pressure-operated valves that permit the operation of only one sprinkler on a lateral, but changing the operation of this sprinkler to the next one in the lateral by a momentary interruption of the water pressure on the sprinkler system.

Fig. 3 shows the clock controller, solenoid valve, and pressure-operated valve used on this sprinkler system. These valves permit the use of smaller sprinkler lateral pipe in the solid system, thus reducing the original cost. The only labor needed for irrigation is for installing and dismantling this system in the field.

Near Mecca, Calif., there is a 20-acre farm having an automatic pump and irrigating system that enables the owners to set dials and leave home knowing that after a preset time has elapsed, a row of sprinklers in the solid sprinkler system will automatically turn on. After the first row has applied the desired depth of water, it is automatically shut off and the next row turned on. This continues until the whole farm is irrigated by sprinklers. Wind is a problem in the area, so a wind-measuring device has been connected into the control system. When the wind blows above a preset speed, the pump and sprinkler are automatically shut off. When the wind dies down, the irrigation system resumes operation. The sprinkler main and lateral pipelines of this system are buried below ground.

Fig. 2 Self-propelled sprinkler system in operation. The system moves at the rate of one mile in 20 hours

Many automatic lawn sprinklers are being installed by golf clubs, factories, and home owners. Most of these systems are controlled by timeclocks operating solenoid or hydraulic valves with a few installations having soil moisture probes or tensiometers controlling the amount of water applied. Our agricultural sprinkling for irrigation developed from the lawn sprinklers in the cities. Is this process being repeated with automation in sprinkler irrigation?

To summarize the possibilities of automation in irrigation, future agricultural systems will be entirely automatic in operation after installation on field and farm. The time of water application will be controlled by a small computer which will evaluate the crop, stage of crop development, root zone depth, optimum soil moisture levels for high-quality crop production and weather to determine when to start irrigation. Irrigation water will be turned off when the proper limit of soil moisture has been reached as determined by soil moisture measuring equipment. Water-control structures will be automatically operated by remote radio control. Surface irrigation will be designed and installed with much better land preparation than used today, through the use of

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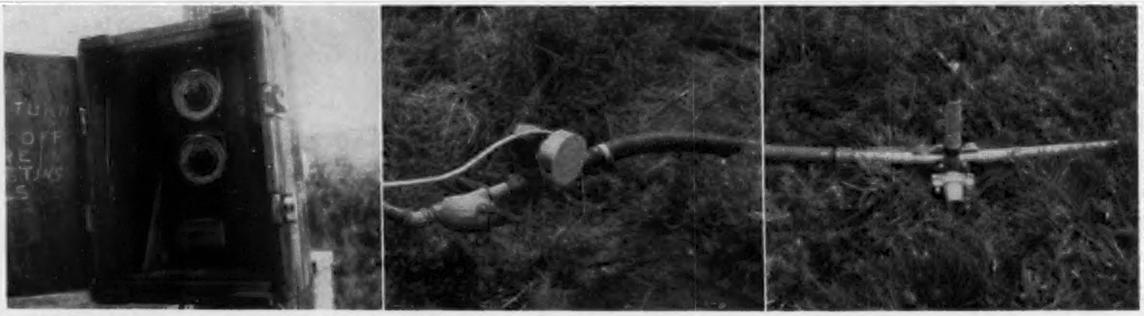

Fig. 3 Components of an automatic solid sprinkler system. The time clock at the left controls the solenoid valve *(center)* which temporarily drops the pressure in the main line thereby activating the pressure valve *(right)* which shuts off the sprinkler and turns on the next sprinkler along the lateral

Installing Deep Neutron Access Tubes

Power drill is used successfully for hard subsoil and rock conditions

J. F. Osborn and R. E. Pelishek

THE neutron probe for soil moisture determinations requires that an access tube be placed in the soil to the extreme depth at which the soil moisture is to be measured.

A number of methods of placement have been employed, depending upon the drilling requirements. Several hand methods have been used, usually on shallow placements. A soil sampling tube with the same diameter as the access tube was found satisfactory in fine alluvial material (2)*.

Soil augers have been used successfully on many soils but usually to limited depths (8).

An extreme method of access tube placement was reported for mountain soils in Utah (5). Pits 2 by 4 ft with the long axis up-and-down slope were dug to a depth of 6 ft with the access tubes installed vertically in the two upslope corners of the pits. The pits were then refilled.

The limitations imposed upon hand methods of installing access tubes led to a search for suitable power equipment. A trailer-mounted foundation exploration drill† was used near Santa Barbara, Calif. Such a trailer-mounted drill was not suited for studies on steep terrain.

It has been suggested that jetting methods might be employed on deep alluvial soils where bedrock is below the total depth (6, 7).

Percussion-type drilling rigs were judged inadvisable due to size which forbids use on rough terrain.

The steep and rugged terrain of many southern California range and watershed areas did not permit the use of heavy equipment, especially when site disturbance was to be kept to a minimum. The various soil and substrata material and the depths to be drilled (in some cases 35 ft) demanded a portable power drill.

The equipment used was a portable, rotary, three-way combination drill‡ (Fig. 1). A small gasoline motor powered the unit.

The principal operation of the drill is similar to the rotary-rig type drills (1, 2) used for well drilling. The rotary-rig system is modified and adapted so that the drill cuttings are transported upward through the hollow drill steel and kelly by air or water. For soils or consolidated subsoil materials where excessive moisture is not a problem, the vacuum system of drilling is used.

Soils high in moisture and clay tend to clog the drill steel and bits when the vacuum system is used. For these conditions, a water pump with a four-way valve to change the direction of flow for either forced or reverse flow drilling may be used.

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*Numbers in parentheses refer to the appended references.

†Personal communication to R. Merriam from Paul R. Nixon, agricultural engineer, Soil and Water Conservation Research Division, (ARS) USDA, Lompoc, Calif.

‡"Mighty-Midget" drill manufactured by Houston Tool Co., Santa Susana, Calif.

The drill and auxiliary equipment may be carried and assembled at the site or mounted and used as a unit on a small truck or trailer.

A level spot about 2 by 4 ft is required for the drilling rig. On steep slopes, terracing or the construction of a temporary platform may be the only suitable means of adjusting the rig prior to the actual drilling.

A special problem encountered in the installation of the access tubes was that the drill did not produce a straight, stable hole of exactly the desired dimensions. Bits of 1¾-in. and 2-in. diameter were tried. The oversize bit provided the best opportunity for installing the access tube in a straight, vertical position. When the tube was in place, the void between the tube and the hole wall was filled with dry fine soil, usually drill cuttings, which were sieved through window screening. The access tube was jarred and vibrated during the repacking and a snug fit was obtained.

It was recognized that backfilling around the access tubes was not desirable, particularly in hard formations, but some compromise was necessary. The access tubing used was 1.625 in. OD. The volume of the backfilled material in a 2-in. hole amounted to less than 1.5 percent of the total effective volume of the soil, if an effective radius of 6 in. for the neutron probe is assumed. If an effective radius of 8 in. is assumed, the disturbed volume is less than 0.8 percent. If an effective radius of 12 in. is assumed, the disturbed volume is less than 0.5 percent (4).

Conclusions

The installation of access tubes for soil moisture sampling with a neutron probe can be accomplished in a variety of ways. When hand equipment cannot be used because of the hardness of subsoil materials, power drilling is necessary.

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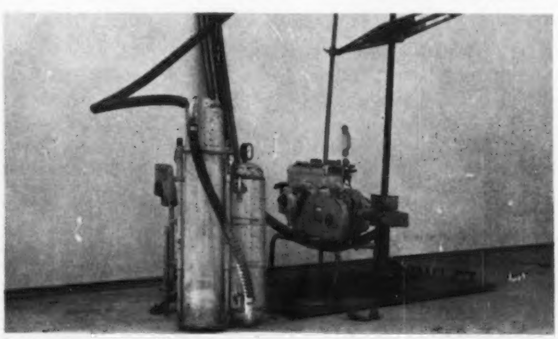

Fig. 1 A portable rotary, three-way combination power drill replaces hand equipment in hard subsoil conditions

Solar-Power Cooling for Livestock Shelters

A feasibility study showing availability of energy for air conditioning

G. M. White and G. W. Isaacs
Assoc. Member ASAE *Member ASAE*

IN recent years the prospect of a diminishing supply of economically recoverable fuels has attracted much attention to the utilization of solar energy. In the United States an average daily horizontal incidence of solar radiation in excess of 1500 Btu per sq ft is not unusual. This is equivalent to more than 44 kw-hr of energy for every 100 sq ft of area. Even with relatively low conversion efficiencies this represents a sizeable quantity of potentially useful energy.

The correlation between the need for space cooling and the availability of solar radiation in certain localities suggests the possibility of using solar energy for cooling purposes. This type of cooling would be especially attractive for applications which require cooling principally during periods of high insolation; for example, the comfort cooling of livestock shelters. The primary purpose of the research project described in this paper was to evaluate the feasibility of using solar energy for such an application.

Availability of Solar Radiation

The average solar energy incident upon a unit surface normal to the solar beam at the edge of the earth's atmosphere is 442 Btu per hr per sq ft. An area located on the earth's surface receives only a fraction of this energy. This fraction depends on the mean density and the length of the path of the solar beam through the atmosphere. These factors in turn are functions of the degree of cloudiness, the time of day, the season and the latitude and altitude of the surface.

A statistical analysis was conducted as a part of this study to determine the availability of solar radiation for air-conditioning purposes in central Indiana. This was accomplished by using past records of the U.S. Weather Bureau for Indianapolis, Ind. The need for cooling as indicated by weather records was correlated to the availability of solar radiation as indicated by concurrent solar radiation data. Five years of data (1952-56) covering the period May 15 to September 15 were used in this analysis, and the temperature-humidity index of the U.S. Weather Bureau was used as an index of comfort or cooling demand. The results of this study are useful as an indication of the frequency of occurrence of certain solar radiation intensities at different times of day and at different levels of heat stress; however, their use is limited in that they do not indicate the actual intensity of solar radiation at any given time or comfort condition.

For computational purposes in this investigation the results of Becker (1)* have been used to determine the total solar radiation incident on the earth's surface at different times of the year and at different latitudes. The solar radiation available at 40 deg north latitude on a clear May 21 day (or July 21) has been designated as that of a typical cooling day in central Indiana. This typical daily solar radiation has been used to evaluate the performance of a solar cooling system on a clear summer day.

Solar Energy Collection

In order for solar energy to be utilized, it must first be collected and concentrated at a relatively high temperature or converted into some other form of energy. This collection operation generally involves an accumulation process and is the function of the solar collector. Both the temperature and the method of collection depend primarily on the solar energy application being considered.

The two kinds of solar collectors most widely used today are the non-concentrating or flat-plate type and the concentrating or focusing type. Focusing collectors have the important advantage of being able to obtain high temperatures and high thermal efficiencies. Thermal efficiencies of 66 percent at receiver temperatures above 325 F have been reported (4) for this type of collector. On the other hand, flat-plate collectors are most efficient when limited in use to the temperature range of 100 to 175 F, although they can produce temperatures somewhat higher. In this range, over-all thermal efficiences of 35 to 50 percent have been obtained. Non-focusing collectors possess several advantages over concentrating collectors. These include lower construction cost, no tracking device required, and the ability to collect diffuse as well as direct solar radiation. The inability of the focusing collector to concentrate diffuse radiation seriously reduces its effectiveness in cloudy weather.

The cooling system considered in this study required input temperatures in the range of 180 to 200 F. This is beyond the operating range of present-day, flat-plate collectors, but due to recent improvements in collector design as advanced by Tabor (5) it appears that these temperatures can be efficiently produced by using a flat-plate collector with two or more cover plates. On this basis the non-focusing or flat-plate collector was selected for use in this study. The optimum orientation of this collector at a latitude of 40

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*Numbers in parentheses refer to the appended references.

deg north was established as one where the collector faces south with a 20-deg tilt from the horizontal.

The performance of the above-mentioned collector was computed for one and two cover plates at noon and at four hours on either side of noon during a typical cloudless cooling day. Values of incident radiation were calculated using the results of Becker (1). Collector heat losses were determined using basic heat transfer equations based on the collector orientation, temperature, and the number of glass cover plates. An 80-deg environmental temperature was used in these calculations. A linear equation of the form

$$Q_{lt} = K\ (t_r - 90)$$

was derived to express the total collector heat loss (Q_{lt}) in terms of the receivers temperature (t_r). The above equation was valid only for receiver temperatures between 110 and 250 F. The heat loss factor, K, is a constant which depends on the number of collector cover plates. K values for one, two, and three cover plates are 0.9, 0.64, and 0.51, respectively. The linear nature of the above expression ideally suited it for use in the collector analysis.

To determine the collector performance, the flat-plate collector was analyzed and expressions were obtained for its collection efficiency. The derivation of these expressions in general followed the approach used by other investigators (2, 6). By expanding on the work of Buelow and Boyd, an expression was derived for the temperature excess, θ, of the collector fluid at a distance X from the leading edge of a flat-plate collector.

Thus $\theta = q_a/K\ [1 - e^{-N}] + \theta_a\ e^{-N}$

where θ = temperature excess at any point X along the collector $= T - T_k$ ($T_k = 90$ F in this study)

θ_a = temperature excess of the incoming collection fluid $= (T_a - T_k)$

q_a = rate at which solar energy is absorbed by the collector receiver (Btu per hr)

K = constant in the heat loss equation

$N = KX/MC$

X = distance along the collector (ft)

M = weight rate of flow of collector fluid per unit collector width, pounds per hour per foot

C = the specific heat of the collection fluid at a temperature, T

e = Naperian base, 2.718.

The above expression relates the temperature excess of the collector fluid to the temperature excess of the incoming fluid, the fluid flow rate, and the solar energy absorption rate.

If the collector fluid leaves the collector at a temperature T_b at $X = A$, the total energy extracted per foot of collector width is

$$M(C_b T_b - C_a T_a)$$

where C_a and C_b are the respective specific heats at the temperatures T_a and T_b. When the fluid used is water, C_a and C_b can be taken as unity, and the energy extracted per square foot of collector surface, q_e, is

$$q_e = M/A\ (T_b - T_a) = M/A\ (\theta_b - \theta_a)$$

Solar collection efficiency, can then be expressed as

$$\eta = q_e/q_i = M\ (\theta_b - \theta_a)/A\ q_i$$

with q_i being the incident solar radiation per square foot of collector surface. If given M, T_a, q_i, and q_a for a particular collector $\theta_b - \theta_a$ can be calculated using the expression for θ. This result can be substituted in the above equation to determine the collection efficiency. Using this procedure, collection efficiencies were calculated for each hour during a typical cooling day for a flat-plate collector having both one and two cover plates. A graphical representation of the results of such calculations for the hour of noon is shown in Fig. 1. Similar results for each of four hours on either side of noon can be found in reference 7.

Description of Cooling Unit

The cooling unit investigated in this study was an absorption cooling unit employing aqueous lithium bromide as the absorbent and water as the refrigerant. This unit was selected primarily on the basis of its relatively low temperature requirement in the generator (180 to 220 F). This made it more favorable for use in conjunction with a flat-plate solar collector. In addition to this advantage the selected absorbent-refrigerant combination also possesses several other advantages. One of these is the fact that water is an ideal refrigerant since it has a high heat of vaporization, is extremely stable, non-toxic and cheap. Also lithium bromide solutions exhibit some of the widest known deviations from Raoult's Law. (Raoult's Law states that the partial vapor pressure of a component whose mol fraction in solution is sufficiently near unity equals the product of the mol fraction and the vapor pressure of the pure solvent.) This means that more water vapor can be absorbed and therefore less solution has to be moved for a given amount of refrigerant produced than if the solutions adhered ideally to this law. This fact is in part responsible for the high coefficients of performance generally obtained in lithium bromide-water

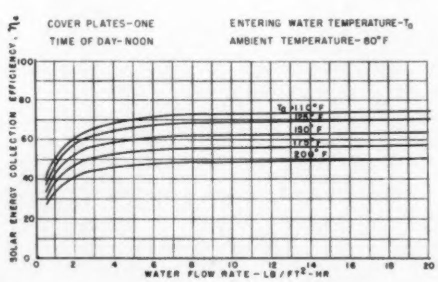


Fig. 1 *(Left)* Solar energy collection efficiency

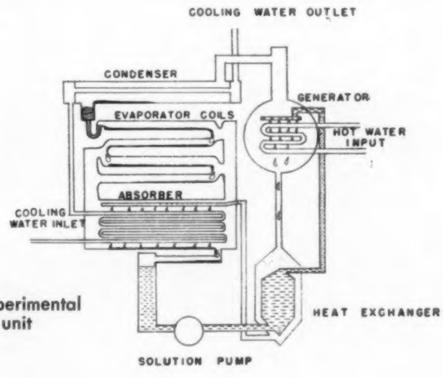


Fig. 2 *(Right)* Experimental absorption unit

systems. The main disadvantages of this combination are: *(a)* the low vacuum which must be maintained in the system at all times and *(b)* the fact that it is corrosive to materials ordinarily used for construction purposes. These disadvantages can be alleviated somewhat in the construction of these units by using selected materials and rigorous inspection techniques. On this basis it was felt that, insofar as this study was concerned, the advantages of the above combination more than outweighed its disadvantages.

Although the absorbent-refrigerant combination used was the same as that employed by several manufacturers in their commercial units, the size and construction of the test unit were quite different. This difference resulted from the fact that the experimental model was specifically designed to operate using heated water as its energy source. Its one-half ton design cooling capacity was based on the theoretical hot water heating capacity of a flat-plate solar collector with 150 sq ft of receiver area.

A schematic flow diagram of the experimental test unit is shown in Fig. 2. Aqueous lithium bromide and water are the working fluids with water acting as the refrigerant. A high vacuum ranging from 7 mm hg on the low-pressure side to 50 mm hg on the high-pressure side must exist inside the unit at all times for proper performance.

The operation of the absorption cooling cycle in the experimental unit was very similar to that of a typical cycle as described in research bulletin 14 of the Institute of Gas Technology (3). In normal operation, hot water flowing through the generator supplies heat energy to a strong (high water content) lithium bromide solution being pumped over the generator coils. This heat boils refrigerant (water) out of the strong solution, and the resulting weak solution drains out of the generator by gravity. Refrigerant vapor released in the generator passes to the condenser where it is condensed due to the action of the cooling water in the condenser tubes. Liquid refrigerant produced in this manner passes through a restrictive orifice into the evaporator. In this study the heat of vaporization of this refrigerant was extracted from water flowing over the evaporator coils. The heat given up by this chilled water was taken as a measure of the refrigeration effect produced by the system.

Performance of Cooling System

The experimental cooling unit was tested to determine its performance and to evaluate its potential usefulness in a solar cooling system. To facilitate this testing, the experimental absorption unit was connected to a temperature-controlled hot water energy source in the laboratory. The respective temperatures of the cooling and chilled water circuits were established at 85 and 55 F. These were selected on the basis of the test conditions used by the Arkla Corp. in rating and testing air conditioners. The water flow rates in these two circuits were set to give temperatures conducive to the optimum performance of the absorption system.

The only variables considered in the experimental setup were the temperature and flow rate of the hot water entering the generator. The laboratory experiments were designed to determine the cooling effect produced by the unit at generator input temperatures of 180, 185, 190, 195 and 200 F. At each input temperature, flow rates of 2.5, 3.75, 5.0, 7.5, 10.0, 15.0, 20.0, 25.0, and 31.2 lb per min were employed to determine the effect of this variable on the performance of the cooling system.

The coefficient of performance of an absorption cooling system can be defined as the ratio of the heat removed by the evaporator to the heat input to the generator. These heats were determined in each test by measuring temperature changes and water flow rates in the respective water circuits. Thus by this technique the performance of the cooling system was determined for each combination of the above test conditions. The performance curves for the experimental absorption unit using a 195 F input temperature are shown in Fig. 3. Similar curves were obtained for the other input conditions. In general, the coefficients of performance of the test unit ranged from 0.50 to 0.63.

Evaluation of Solar-Cooling System

In order to evaluate the combined performance of a solar-collection-cooling system the performance data for each of the individual components were combined to obtain the over-all system characteristics. The system studied consisted of a flat-plate collector (150 sq ft receiver area), a lithium bromide-water absorption unit, and a solar energy storage tank. The collector-generator circuit was assumed to be arranged as shown in Fig. 4 with the energy storage tank located between the generator exit and the entrance to the flat-plate collector.

Normally the collection fluid circulates in the system as long as cooling is required and water at 180 F can be supplied to the generator of the absorption unit. This fluid circulates through the flat-plate collector whenever the solar radiation intensity on the collector is such that useful energy can be extracted. If no heat energy can be extracted and if 180-deg water is available in storage, the transfer fluid by-passes the collector by means of the by-pass valve and flows directly to the generator until either the storage temperature drops below 180 deg or the solar radiation intensity increases to a point where energy can again be extracted from the collector. The storage tank is sized and the fluid flow rate fixed, such that the temperature of the fluid in the collection circuit remains below boiling on a typical cooling day.

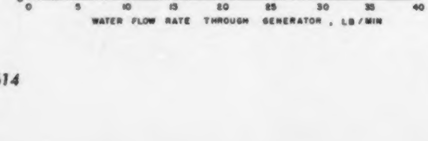
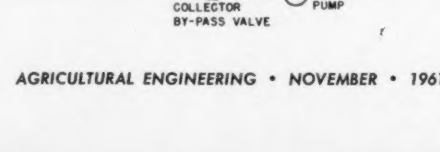
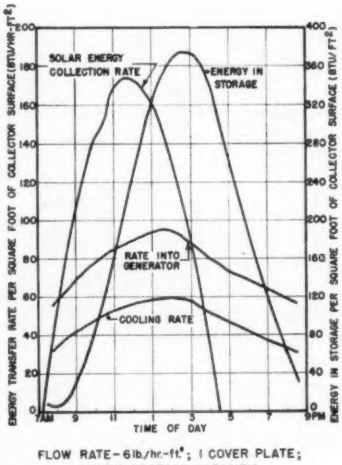


Fig. 3 *(Left)* Performance curves for absorption unit, 195 F input temperature

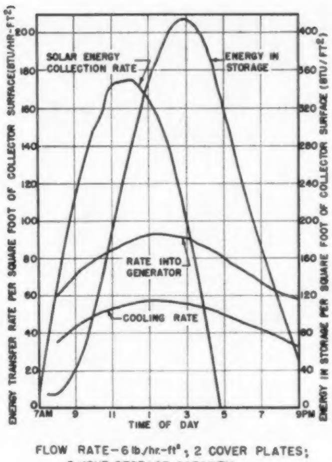
Fig. 4 *(Right)* Proposed collector-generator circuit



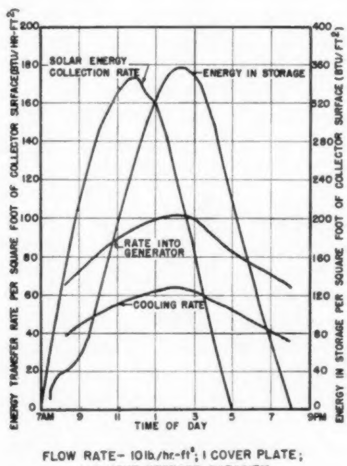


FLOW RATE – 6 lb./hr.-ft²; 1 COVER PLATE; 3 HOUR STORAGE CAPACITY

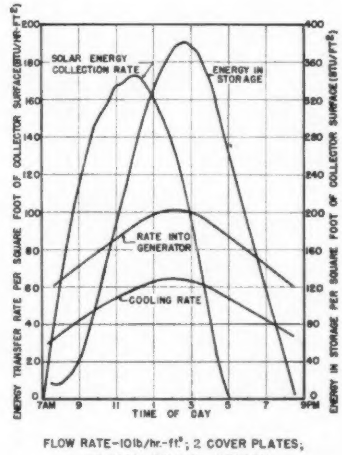
Fig. 5 Solar energy performance curves



FLOW RATE – 6 lb./hr.-ft²; 2 COVER PLATES; 3 HOUR STORAGE CAPACITY



FLOW RATE – 10 lb./hr.-ft²; 1 COVER PLATE; 1 1/2 HOUR STORAGE CAPACITY



FLOW RATE – 10 lb./hr.-ft²; 2 COVER PLATES; 1 1/2 HOUR STORAGE CAPACITY

The over-all performance of the collection-cooling system has been determined using a stepwise graphical analysis. This analysis (as described in reference 7) took into account the variation in collector performance with fluid flow rate and time of day. It also considered the variation in absorption-system performance as a function of generator input temperature. Results were obtained for both one and two collector cover plates at fluid flow rates of 6 and 10 lb per hr per sq ft. These results as presented in Fig. 5 show the solar energy collection rate, the solar cooling rate, and the quantity of energy in storage as a function of time for a typical cooling day.

Of particular significance in these results is the fact that the theoretical maximum solar cooling occurs 1½ to 2 hours after the peak solar radiation intensity. In addition to this effect, energy storage also reduces extreme temperature conditions in the collector-generator circuit and extends the length of the over-all cooling cycle by approximately three hours on a typical day such as that considered. A fluid flow rate of between 6 and 10 lb per hr per sq ft and an energy storage capacity of two gal per sq ft of collector surface appears to be satisfactory for the proper performance of the assumed cooling system.

An examination of the above-mentioned graphical results indicates that the high fluid flow rate (10 lb per hr per sq ft) tends to increase the average rate of cooling while shortening the total length of the cooling cycle. The over-all effect appears not to be very significant in that the daily over-all cooling efficiency of the two flow rates as shown in Table 1 differed by less than one percent in each case. The daily over-all cooling efficiency is defined as the ratio of the total daily cooling obtained to the total daily solar radiation incident on a given collector surface.

An inspection of Table 1 along with the graphical results already mentioned leads to the conclusion that the only significant advantage possessed by the collector with two cover plates is its 1½ percent advantage in daily over-all cooling efficiency. It is debatable as to whether this small increase in efficiency warrants the extra expense of

(Continued on page 621)

TABLE 1. DAILY OVERALL COOLING EFFICIENCIES FOR SOLAR COOLING SYSTEM

Fluid flow rate	Number of cover plates, percent 1	2
6 lb per hr-ft²	23.8	25.3
10 lb per hr-ft²	24.6	26.2

Engineering in Broiler Housing

Hajime Ota and E. H. NcNally
Member ASAE

Some problems affected by climate

BROILER housing problems are receiving considerable attention because of condemnations at the slaughtering plants.

Seasonal Variations in Size of Broilers and Rate of Condemnation

Since January 1, 1959, all poultry in interstate shipment must be inspected. The inspection data reported from the poultry processing plant may be useful in analyzing the performance of broiler houses (1)*. The data show that the average live weight of inspected broilers in the United States in 1959 remained about constant from January to September, that is, between 3.2 to 3.3 lb per broiler. From September to December the average weight increased to 3.4 lb. Similar trends seem to reappear in 1960.

Additional data on condemnation show further relationship of climate to housing. Condemnations were related to time of year in Fig. 1. The lowest condemnation rate in 1959 occurred from May through October. The losses in the fall of 1959 continually increased from 2.0 to a peak of 3.8 percent in March 1960. At this time parts of the southern states were exposed to the lowest temperatures and the most severe snowstorms in years. Generally the United States poultry inspection data show that heavy broilers are produced in the fall, but that condemnation increases in cold weather. Broiler production appears to be more efficient in feed conversion in the fall than at other seasons. In warmer weather smaller birds are produced with less condemnation. All of these data give some implications of housing difficulty.

In 1959, 71 percent of the broilers inspected were produced in the South Atlantic and South Central states. The inspection and weather data of five states – Alabama, Georgia, Mississippi, Delaware and Maine – representing three climatic zones were studied to relate inspection data to temperature. Fig. 2 shows a vastly different picture of condemnation and growth rates than Fig. 1. Growers in Maine consistently produced the heaviest broilers throughout 1959, averaging 3.79 lb per broiler. Delaware was next with an average of 3.52 lb, followed by Georgia, 3.30 lb, Alabama, 3.28 lb and Mississippi, 3.15 lb. Note the depressed weight of broilers in all three southern states during the cold spell of March 1960, which did not occur in Delaware and Maine. The relative ranking of these states remained the same in 1960. Generally, smaller broilers are produced in all of these states during the hot months, June through August. This perhaps indicates reduced feed intake and poor feed conversion.

The condemnation rate in 1959 for these states showed Maine with the lowest yearly loss of 1.26 percent of live weight of broilers inspected, followed by Delaware, 1.48 percent; Georgia, 1.74 percent; Alabama, 1.82 percent, and Mississippi, 2.19 percent. Generally in 1959 less condemnation occurred from April through October. With the exception of Mississippi, the 1960 condemnation rate tended to flatten out after May, as in the previous year, but at a higher rate.

What temperature conditions exist in these broiler-producing areas of each state? For comparison, the temperature data of Maine, Delaware and Mississippi were selected. In Fig. 3, Mississippi consistently showed the highest average temperature every month, followed by Delaware, and Maine with the lowest temperature. In 1959, Maine had 161 days with minimum temperatures below 32 F, while Mississippi had 47 days. The average temperature of Mississippi in February and March 1960 was a few degrees lower than in 1959. But closer study of the 1960 weather report showed Georgia had the coldest March in 70 years. Since monthly average air temperatures of Alabama are about the same as Georgia (in summer Georgia is about 2 deg cooler than Alabama), the curve for Georgia is shown to reflect these states. Also the U.S. Weather Bureau recorded (2) that

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*Numbers in parentheses refer to the appended references.

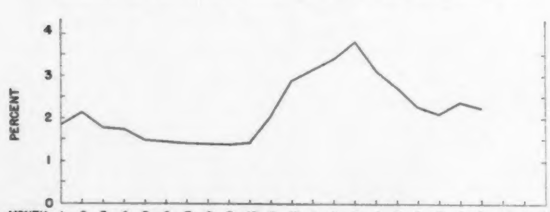


Fig. 1 Percent by total weight of condemnation of broilers inspected under federal poultry inspection, 1959 and 1960

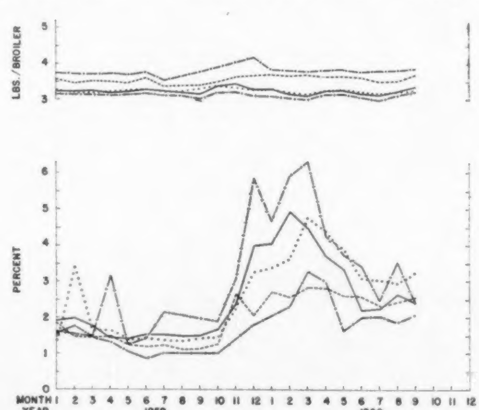


Fig. 2 Average weight of broilers and percent condemnation by total weight of broilers inspected in selected states under federal poultry inspection, 1959 and 1960

hundreds of broiler houses collapsed under ice and snow in Georgia, and further noted that some areas of the South were without electric power during the extreme cold spell. More adequate insulation, stronger construction against snow and wind loads, and properly sized standby generators for emergency use are evidently needed.

Housing Problems

Clearly one of the major factors in broiler production is housing. The better broiler houses in Maine with insulated sidewalls and ceiling, have an over-all weighted U value of less than 0.2 Btu per hour per square foot per degree F. In contrast the better shelters in Georgia, designed for mild spring and fall weather use only, have an estimated overall U value greater than 1.28 Btu per hour per square foot per degree F. Because of little insulation and an indeterminate amount of air leakage from loose covering over sidewalls and ridge vents, no firm estimate can be made of heat losses. However, if a thin ceiling were provided and the sidewalls were covered inside and outside with air-impervious film, the U value might be lowered to 0.5 Btu per hour per square foot per degree F. Thus by using the heating capacity of the brooders, it may be possible to maintain a draftfree house of 50 to 60 F when outdoor temperature falls below freezing. Besides ambient temperature control, these simple measures will materially reduce the radiant heat loss from the birds to the uninsulated metal roof and sidewalls.

The importance of a ceiling is not appreciated in the South. In the New England states, it is almost axiomatic that, if an equivalent of two inches of batt insulation is provided in the walls, double this amount is applied to the ceiling. This practice reduces the effect of solar heat on broilers in the summer, decreases the heat loss in the winter, and eliminates the moisture condensation on the bare roof. Other measures to remedy the hot roof problem have been published (3, 4, 5). A thin polyethylene film covering a cold surface (with air space between it and the roof) may reduce its heat pickup by 50 percent (6).

One of the chief problems in broiler housing is either dissipation or conservation of heat, depending on the season of the year. The need to supplement bird heat is greatest at low temperature and at early stage of broiler growth. For example, the total heat produced by a 33-day-old bird is 23.5 Btu per hour per pound of live weight at 59 F, but only 20.1 Btu per hour per pound of live weight at 80 F, a reduction of about 14 percent (7). Later near 75 days of age the total heat produced was 13.5 Btu per hour per pound of live weight at 65 F and 11.2 Btu per hour per pound of live weight at 85 F, a difference of 2.3 Btu.

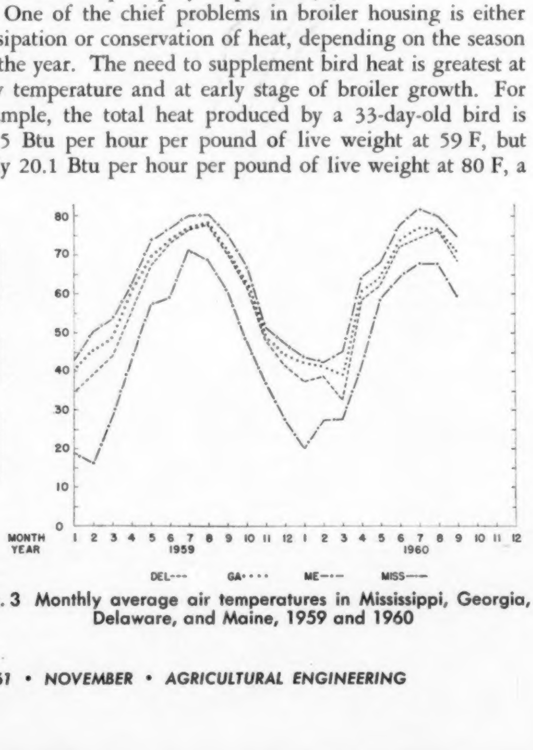


Fig. 3 Monthly average air temperatures in Mississippi, Georgia, Delaware, and Maine, 1959 and 1960

Does overheating of young birds under the brooder or in the pen decrease their resistance to subsequent chilling conditions? Young rabbits grown at 90 F were less resistant to chilling than those raised at a lower temperature (8). One of the objectives in brooding should be to "clothe" the birds as soon as possible. The feathering of the birds is accelerated at low temperatures. The ambient temperature which promotes good growth and feathering under present brooding methods needs investigation. Poultrymen now attempt to maintain room temperatures near 60 F for all ages of growing birds.

Different air movement at various temperatures may greatly affect heat loss from growing chickens. There is a need for wind data for poultry of various ages that will show combinations of air temperature and air movement having the same rate of cooling. For example, in the case of soldiers' hands and faces being exposed to a 15-mph wind and air temperature of 42.5 F (9), the rate of cooling was similar to still air at −27 F. Drury (10) at Georgia has obtained some information of this nature for broilers. Information of this kind will be useful in applying the daily weather reports of expected temperature and wind velocity to poultry house management.

Air movement around the bird is particularly advantageous for dissipating heat in the summer. With a given fan capacity, air velocity among the birds may be increased by channeling air flow into the living space of the birds. Air movement in combination with fan and pad evaporative cooling on hot days with low humidity would be even more beneficial. This benefit could occur even in hot humid areas of the southeastern United States where decreased humidity prevails from about 11:00 a.m. to about 6:00 p.m. on hot days (11).

Are the Southern growers exposing chickens to excess carbon dioxide and carbon monoxide and insufficient oxygen in winter? The recent recommendations of "tightening up" the houses, the use of brooder heat when needed and the use of solid hover walls without escape of combustion products from gas brooder, all may be harmful to growing birds. Since most Southern growers use gas brooders which expel combustion products within the house, the possibility of gas poisoning may be real. The densities of various elements in combustion at 60 F are as follows:

Carbon dioxide — 0.1161 lb per cu ft
Carbon monoxide — 0.0739 lb per cu ft
Air — 0.0763 lb per cu ft
Oxygen — 0.0844 lb per cu ft

Thus in a space such as enclosed by a hover wall, both carbon dioxide and to a lesser extent carbon monoxide may build up. This in turn will decrease the amount of oxygen for combustion, leading to more production of carbon monoxide. Theoretically, the perfect combustion of a pound of propane requires about 15.7 lb of air (or 3.6 lb of oxygen) to produce 3 lb of carbon dioxide and 1.6 lb of water. Since all combustion is not perfect, there is some unknown amount of carbon monoxide. In addition, the birds expire about 13.5 volume percent of oxygen and 6.5 percent of carbon dioxide with oxygen consumption of 0.83 cc per

(Continued on page 623)

Response of Corn Yields to Bedding Soils

Some field results from controlled drainage investigations

C. E. Beer and W. D. Shrader
Assoc. Member ASAE

THE Edina soil series of Southeastern Iowa and northern Missouri occupy areas of flat topography. Internal drainage is poor. For these areas, where the topography and soils permit, surface drainage is the most practical method of removing excess water from the land. One method of surface drainage that has been used on the Edina soils is bedding, in which the field is divided into narrow-width plow lands with the deadfurrows running parallel to the prevailing land slope.

Little is known about the relative returns from investment in a bedding system in comparison with other surface or subsurface drainage methods. Bedding requires that some topsoil be moved in order to obtain the desired grade for drainage. However, the effect on crop yields of topsoil removal and movement in land-forming operations, such as bedding, is not quantitatively understood. This paper presents the summary and analysis of six years of corn yield data with drainage (bedded *vs* level) and fertilizer variables from a study on the Southern Iowa Experimental Farm near Bloomfield.

A surface drainage experiment was initiated on this experimental farm in 1952 with the following objectives:

(a) To compare corn yields from bedded plots with yields on plots which had been levelled to zero grade

(b) To compare corn yields from different fertilizer treatments applied to the cropping systems of continuous corn and a corn-oats-meadow (COM) rotation

(c) To study the interactions between drainage, fertilizer and cropping-system variables.

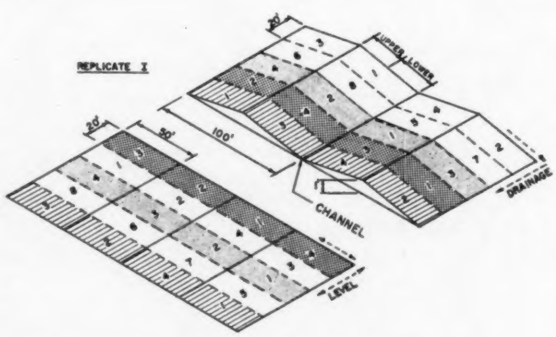
SOIL CHARACTERISTICS

The soil on the Southern Iowa Experimental Farm is Edina silt loam, an argipan planosol or claypan soil which developed from about 70 in. of weathered loess on level topography under a tall grass prairie vegetation.

The physical properties of this soil were reported by Schwab *et al* (2)*. Their results show the aeration porosity varies from 11.6 percent in the surface 6 in. to 0.14 percent in the lower portion of the B horizon. The B horizon is included between the depths of 1.5 and 4.0 ft below the surface. Since the aeration porosity is 1 percent or less below 2.5 ft, poor internal drainage is indicated. A mechanical analysis shows the surface 6 in. contains 3.5 percent sand, 74.9 percent silt, and 21.6 percent clay, whereas the heavy soil stratum between 24 and 29 in. below the surface contains 54.6 percent clay. The average hydraulic conductivity at 3-ft depth obtained from 34 observations using the auger hole method was 0.0145 ft per day.

DESIGN AND LAYOUT

A diagram of the experimental layout showing replicate I is given in Fig. 1. The experimental design is a form of the split-split-plot with drainage as the whole plot treatment, cropping system as the subplot treatment, and fertilizer application as the sub-subplot treatment. It varies, however, from the standard design because of the arrangement of the fertilizer applications to the sub-subplots. Each whole plot is an area 100 ft wide by 200 ft long. Each subplot and sub-subplot, respectively, are areas of 20 by 200 ft and 20 by 50 ft. In the following discussion, whole plots, subplots and sub-subplots will be called blocks, columns and plots, respectively.



FERTILIZER TREATMENTS

TREATMENT NUMBER	POUNDS OF N, P_2O_5 AND K_2O APPLIED PER ACRE. CORN	OATS	CONT. CORN
1	0+20+20	0+40+40	0+20+20
2	30+20+20	0+40+40	30+20+20
3	0+80+20	0+160+40	0+80+20
4	30+80+20	0+160+40	30+80+20
5	----	----	30+80+20
6	----	----	60+80+20
7	----	----	120+80+20
8	----	----	240+80+20

CROPPING PLAN

1954	O	M	C	C
1955	M	C	O	C
1956	C	O	M	C
1957	O	M	C	C
1958	M	C	O	C
1959	C	O	M	C

NOTE: ALL CORN RECEIVES 100 LBS./A OF 0-20-20 IN THE ROW AT PLANTING TIME; REMAINDER IS BROADCAST AND PLOWED UNDER. THE MEADOW CROP DOES NOT RECEIVE A DIRECT APPLICATION OF FERTILIZER.

Fig. 1 Surface drainage-rotation-fertilizer experiment (Southern Iowa Experimental Farm)

Presented as Paper No. 61-202 at the Annual Meeting of the American Society of Agricultural Engineers at Ames, Iowa, June 1961, on a program arranged by the Soil and Water Division. Approved as Journal Paper No. J-4079 of the Iowa Agricultural and Home Economics Experiment Station (Project No. 1003).

The authors — C. E. BEER and W. D. SHRADER — are, respectively, instructor of agricultural engineering and associate professor of agronomy, Iowa State University, Ames.

*Numbers in parentheses refer to the appended references.

Drainage Treatment

Each block on which the drainage treatment was applied was replicated three times. Therefore, three blocks were levelled (to zero grade) to remove depressions and the remaining three blocks were bedded as shown in Fig. 1. (The levelled plots are representative of poorly drained land.) The beds were constructed with a bulldozer and have the channels for drainage at 100-ft spacing. The arrows indicate the grade in the channel and the drainage in the direction of the cultivated rows. Each bed was subdivided into the upper and lower portions for sampling and analyzing purposes.

Cropping-System Treatment

Each block was divided into five columns, 20 ft wide by 200 ft long, and was cropped according to the cropping plan shown in Fig. 1. Each block consisted of five columns, three of which were randomly allocated to a COM rotation and two to continuous corn.

Fertilizer Treatment

Each column was divided into plots 20 ft wide by 50 ft long on which were applied the various fertilizer treatments. The numbers in the center of the plots indicate the fertilizer treatment which a particular plot received. The plots in the three rotation corn columns and one continuous corn column received fertilizer treatments 1 through 4 which is a factorial design of two levels of nitrogen and phosphorous. The remaining continuous corn column received fertilizer treatments 5 through 8, which is a geometric increase in nitrogen application with the phosphorous application held constant. Treatments 4 and 5 are the same which serve as a common treatment for measuring column differences.

TABLE 1. ANALYSIS OF VARIANCE FOR BEDDED *VS* LEVEL ON COM ROTATION AND CONTINUOUS CORN

Continuous Corn			Rotation Corn		
Source	d.f.	M.S.	Source	d.f.	M.S.
A — Replicates	2	147.62	A — Replicates	2	76.84
D — Drainage	1	914.38*	D — Drainage	1	92.25
AD — Error I	2	15.71	AD — Error I	2	155.25
C — Column effect	1	14011.75**	Y — Year effect	2	2039.70**
CD	1	536.67**	DY	2	65.75
Error II	4	10.86	Error II	8	103.04

*Significance 0.05 level
**Significance 0.01 level

TABLE 2. SIX-YEAR AVERAGE CORN YIELDS FOR BEDDED AND LEVEL PLOTS
(Bushels per acre)

Continuous Corn			Rotation Corn			
Fertilizer treatment	Bedded	Level	Fertilizer treatment	Years	Bedded	Level
No. 1	41.3	39.3	No. 1	1954 &	99.1	99.2
2	56.2	58.5	2	1957	101.6	99.6
3	36.8	42.3	3		99.4	101.3
4	54.0	56.4	4		101.4	103.9
5	54.7	68.5				
6	66.1	84.1	1	1955 &	89.1	76.5
7	84.6	102.9	2	1958	94.4	88.3
8	93.0	104.5	3		80.0	81.4
av.	60.8	69.6	4		99.6	93.4
			1	1956 &	77.1	82.0
			2	1959	86.9	82.0
			3		83.7	82.0
			4		86.8	83.0
				av.	91.6	89.4

STATISTICAL ANALYSIS

The statistical analysis is based on the average corn yields for the period 1954-59. Although data were collected in 1952 and 1953, the 1954-59 period was chosen in order to exclude two years of corn yields from the COM rotation during the 1952-53 period when no meadow preceded the corn.

A complete analysis was made by dividing the data into three major sections with two parts to each section. Only the main effects and interactions which are pertinent to the discussion in this paper are given in Tables 1 and 3. For a discussion and printing of the complete analysis, the reader is referred to the research bulletin by Beer *et al* (1).

RESULTS

Drainage: Bedded vs Level

The increase in corn yield due to surface drainage by bedding is negligible for the rotation corn. This follows from Table 1 in which the mean square for drainage, *D*, is smaller than error *I*, and also from Table 2 in which the yields when averaged over all variables except drainage effect (level *vs* bedded), shows a difference of only 2.2. bu per acre.

However, in the continuous corn analysis, the main effect, *D*, shows that corn yields were significantly lower on the bedded as compared to the level plots. The 6-year average corn yields for the level and bedded plots (Table 2) were 69.6 bu per acre and 60.7 bu per acre, respectively, which is a difference in yield of 13 percent. Most of the difference in average yield resulted from relatively wide yield differences between level and bedded plots at the high nitrogen rates. This relationship is shown by the significance of the CD interaction for continuous corn in Table 1.

The following soil and management factors combine to create a changed environment for growing plants on beds in Edina soil.

1 The removal of topsoil during the construction of the beds tended to expose the ashy gray subsurface horizon and in some cases to cover the upper portion of the beds with a layer of this less desirable soil. The actual depth of disturbance would depend on the natural topography; however, the idealized cross section shows that the topsoil would be removed to an average depth of 0.5 ft (Fig. 1).

2 Tillage operations are performed with conventional farm machinery at right angles to the channel grade and tend to create obstructions to the flow of surface water. This

TABLE 3. ANALYSIS OF VARIANCE FOR UPPER DRAINAGE POSITION *VS* LOWER DRAINAGE POSITION ON COM ROTATION AND CONTINUOUS CORN

Continuous Corn			Rotation Corn		
Source	d.f.	M.S.	Source	d.f.	M.S.
P — Drainage Position	1	6288.34**	P — Drainage Position	1	8439.17**
$N_1 \times P/C_2$	1	329.89**	PY	2	2832.93**
Error III	16	10.59	FP	3	5.52
			Error III	24	12.55

*Significance 0.05 level
**Significance 0.01 level

. . . Bedding Soils

causes ponded conditions to occur in the lower part of the bed. Even though this condition was alleviated to some extent by using hand equipment to remove the ridges created by the tillage machinery, drainage was poorer on a portion of the bedded than on the level plots. The results indicate a failure of the method of drainage employed, rather than a negative response to improved drainage.

Drainage Position: Upper vs Lower

The differences in yields between the upper and lower portions of the bed are affected by the changed environment, climatological factors and the level of fertilizer application. In the rotation corn analysis, both drainage position *(P)* and the year-drainage position interaction*(PY)* were significant at the 0.01 level (Table 3). The significance of the drainage position is obvious after noting the average yields of 102.5 bu per acre and 80.7 bu per acre, respectively, for the upper and lower drainage positions (Table 4). The PY interaction results from the following two factors:

(a) Since the grade in the channel is at right angles to the columns, the resistance to the flow of water as influenced by the cover in the channel is different each year.

(b) The amount and intensity of precipitation and its time of occurrence in relation to the age of the corn influences the yield differences for the drainage positions.

It should be pointed out that the actual geometry of the beds after cropping differs somewhat from the cross section given in Fig. 1. The channel has become wider and affects a larger portion of the area represented by the lower drainage position than that represented by the V notch in Fig. 1. Thus it would be possible for the collection of water in the bottom of the bed to increase the yields in dry years and reduce yields in wet years. The yield data show that corn yields were higher on the upper positions of the beds in 1957, 1958, 1959, lower in 1956, and approximately the same on both positions in 1954 and 1955. The monthly precipitation as measured at the experimental farm cannot be correlated with the highest yield occurring on a given position, except possibly for 1956. The entire 1956 season was generally dry, but high-intensity showers occurred during which there was some runoff from the higher to the lower positions of the beds.

TABLE 4. SIX-YEAR AVERAGE CORN YIELDS FOR UPPER AND LOWER DRAINAGE POSITIONS ON BEDDED PLOTS
(Bushels per Acre)

Continuous Corn			Rotation Corn			
Fertilizer treatment	Upper	Lower	Fertilizer treatment	Years	Upper	Lower
No. 1	52.3	30.4	No. 1	1954 &	112.8	65.5
2	71.3	41.3	2	1957	119.8	69.0
3	44.7	29.4	3		101.9	58.2
4	66.8	41.1	4		121.8	77.4
5	67.4	42.0				
6	81.8	50.4	1	1955 &	106.3	91.8
7	96.7	72.6	2	1958	106.5	96.7
8	97.5	88.3	3		106.1	92.8
av.	72.4	49.4	4		106.5	96.3
			1	1956 &	80.8	73.5
			2	1959	87.8	86.0
			3		88.2	79.1
			4		90.6	83.0
			av.		102.5	80.7

Although the lower position is more affected by the top soil removal, the interaction between fertilizer and drainage position (FP) is not significant for the rotation corn. This is due to the comparatively low fertilizer application rates for rotation corn.

The effects of drainage position were very pronounced for continuous corn. The average yield of 72.4 bu per acre obtained from plots in upper drainage position is significantly higher than the average yield of 49.4 bu per acre obtained for the lower position (Tables 3 and 4).

The use of eight fertilizer treatments in the continuous corn analysis permits a better evaluation of the effect of higher nitrogen application rates to offset the changed environment in the lower drainage position. This is best shown by the interaction of linear nitrogen with position ($N_1 \times P/C_2$) which is significant at the 0.01 level in Table 3. As a result, it is known that the slopes of a straight line which show the yield response to level of nitrogen application are significantly different for the upper and lower positions. A quantitative evaluation of the difference may be obtained from the average yields in Table 4. Average yields with 60, 120, and 240 lb of nitrogen are 81.8, 96.7, and 97.5 bu per acre, respectively, on the upper position of the beds as compared to 50.4, 72.6 and 88.3 bu per acre on the lower positions. Therefore, the yield increase from 120 to 240 lb of nitrogen was 14.9 bu more on the lower than on the upper positions. This indicates that the higher nitrogen application rate was instrumental in offsetting the changed environment in the lower drainage position. A similar result was obtained when yields were compared at the high nitrogen levels between bedded and level plots (Fig. 2).

SUMMARY AND CONCLUSIONS

Bedding is not feasible on a Planosol soil (claypan soils of flat lands) for conditions comparable to those described in this paper, which include 100-ft wide beds, 0.15 percent grade in the channel and tillage operations performed at right angles to the direction of the grade. A summary for the period 1954-59 shows that the difference between the level and bedded plots is dependent upon the type of cropping system used. The yield on the bedded plots was de-

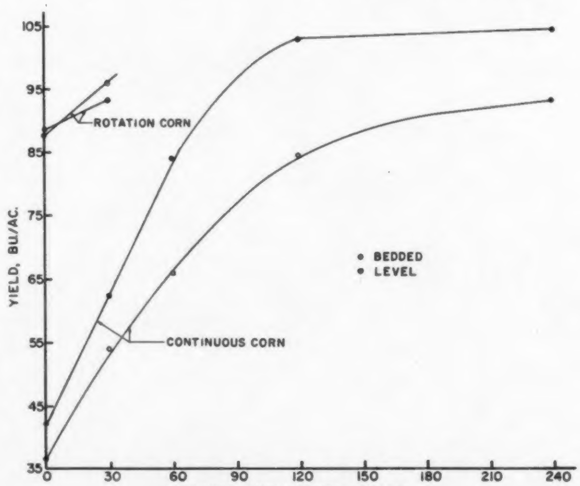


Fig. 2 Six-year average corn yields for bedded and level plots

pressed about 12.5 percent in the continuous corn system while in the COM rotation, a slight (2 percent) increase in yield was obtained. The 6-year period is considered a fair test of the effect of bedding on yields since it contained years with wide differences in precipitation. The amount of precipitation recorded at the experimental plots for the period April through August varied from 12.41 in. in 1956 to 23.6 in. in 1958. The long-term mean for this five-month period is 19.12 in.

Within the bedded plots the corn yields vary with respect to the position of the sampled area on the bed. The effect of disturbing and removing the topsoil to build up the crown or top of the bed, as well as year-to-year climatic factors, influence the corn yields. When averaged over the 6-year period, the yield was much lower in the lower portion of the bed which is adjacent to and a part of the channel for the bedding system. The average differences in yield between the two positions are 21.8 and 23.0 bu per acre, respectively, for rotation corn and continuous corn. These differences reflect a 22 and 34 percent reduction in yield in the lower positions. The data also show that the higher rates of nitrogen are effective in offsetting the detrimental effects of the poorer environment in the lower position of the beds. A statistical test shows that, if yield was plotted as a function of increasing nitrogen application, the yield increase per pound of nitrogen added at the higher nitrogen applications is greater in the lower position than in the upper position of the bed.

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. . . Solar-Power Cooling

(Continued from page 615)

providing the second cover plate. It should be remembered, however, that this increase represents better than a 6 percent increase in the capacity of the cooling unit. In any given application the decision to use two cover plates will depend on the economic worth of the additional cooling to be gained.

Cooling requirements for specific livestock shelters have been established based on heat production values, ventilation rates, and assumed environmental conditions for the different livestock. The results indicate that for the assumed conditions a flat plate collector with an area approximately 50 percent larger than the floor space of the building itself would be required for solar air conditioning.

The need for auxiliary cooling in a solar cooling system has been evaluated. Because of the variability of incident solar radiation, the capacity of a solar cooling system at any given time cannot be predicted. Therefore, a completely solar-powered cooling system can be reliable only insofar as it can be depended on to reduce the level of peak heat stress within a given space. If 24-hr temperature control is required some means of auxiliary cooling must be provided. An auxiliary energy source operating the absorption cooling unit appears to offer the most practical solution to this problem.

An economic comparison of solar cooling with conventional types of air conditioning has been made. The comparative cost relationships were simplified by assuming that the main factor influencing this comparison was the relative cost of energy among the different systems. The results indicate that solar energy cannot now compete with conventional fuels insofar as cooling applications are concerned. However, if wintertime solar space heating is also considered, the cost of utilizing solar energy could be greatly reduced; thereby, it could possibly be competitive with conventional fuels in certain localities at the present time.

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. . . Access Tubes

(Continued from page 611)

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. . . Automation Near in Irrigation

(Continued from page 610)

electronically controlled leveling devices. Sprinkler systems will be of the self-propelled or solid-system types, both of which use a minimum of labor. As a result of the better control and application of water, the efficiency of water application will be raised and irrigation water supplies will be conserved.

Possibilities for automation in irrigation are limited only by the imagination of the inventor and researcher. Inventions will be applied as fast as they are proved economical on a large scale. It will take a larger capital investment in irrigation equipment, but it will pay off in reduced labor. We now have the knowledge and equipment to mechanize much of our agricultural irrigation. Automation is only a short step in the future.

Manometer for Measuring Water-Surface Levels in Irrigated Fields

Hollis Shull
Assoc. Member ASAE

A MANOMETER can be used to measure water-surface levels in irrigated furrows or borders. A staff gage or water-level recorder placed at the location of one of the manometer hoses will provide a reference from which water depths can be calculated from manometer data. A manometer has a number of advantages — as well as some disadvantages — over staff gages and water-level recorders.

Description of Manometer

Described here is a manometer designed to measure water-surface slope and water depths in irrigated furrows. The manometer was constructed on a circular sheet of ½-in. thick plywood fitted with a pivot at the center and fastened to a wooden frame (Fig. 1). It could be rotated to bring the manometer tubes into a vertical position. The manometer had seven tubes, but any desired number of tubes could be used. Rubber hoses were used to connect the top of each tube to a manifold. Screw-type pinch clamps were used to clamp off the rubber hoses leading to any tubes not being used. The manifold was connected through a valve to a small, hand-operated priming pump. An air-inlet valve was connected to the end of the manifold opposite the pump valve. Rubber hoses connected the lower ends of the tubes to small pipe unions. Ordinary cross-section paper was used as a scale.

Operation of Manometer

The manometer was placed at a convenient location in the field and adjusted so the tubes were vertical. A short length of garden hose connected the pump to the manifold valve. A section of clear plastic tubing of appropriate length and ⅜ in. inside diameter was fastened to each union at the bottom of the manometer tubes. The open end of each length of plastic tubing was placed in a selected location in the furrow and held in a vertical position by a stiff wire support. The pinch clamps were closed. A staff gage was placed in the furrow at one of the manometer tubing locations. The furrow-bottom profile was obtained by surveying, and the staff gage was referenced to the furrow-bottom profile.

When water arrived at the first manometer tubing location, the clamp above the corresponding manometer tube was opened and water was pumped through the tube. Pumping was continued until inspection of the plastic tubing showed that all air bubbles had been removed.

When water arrived at the next manometer tubing location, the first tube was clamped, the second tube was opened, and water was again pumped through the tubing into the manifold. When pumping was completed, the pump valve was closed and the clamp on the first tube was opened. Air was allowed to enter the manifold from the air valve until the water level in both tubes could be read on the scale. Relative water-level readings between the two locations could be obtained from the manometer readings. With the staff gage located at the second manometer tubing location, water-surface levels and the depth of water in the furrow could be determined by recording the staff gage reading when the manometer was read. The same clamping and pumping procedure was followed when water arrived at each succeeding manometer tubing location in the furrow.

Accuracy of Manometer

As a general indication of accuracy, none of a large number of readings showed the water level to be higher as readings progressed downstream. Numerous readings were taken with tubes only 10 ft apart in the furrow, and water-elevation differences were measured. More specific determinations of the accuracy of the manometer were made by both laboratory tests and field observations.

The laboratory test was conducted by placing one manometer hose in a container of water with constant elevation and another manometer hose in a container of water that was moved upward slowly by mechanical means. A

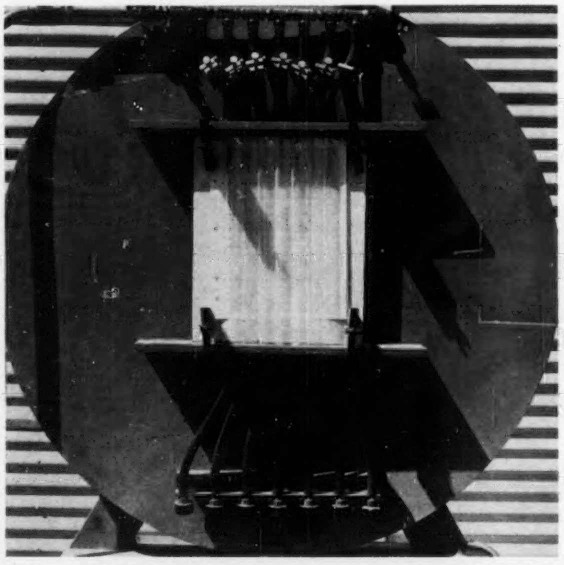

Fig. 1 Manometer designed to measure water-surface slope and water depths in irrigated furrows

An Instrument News Contribution from the Soil and Water Conservation Research Division (ARS), USDA. Articles on agricultural applications of instruments and controls and related problems are invited by the ASAE Committee on Instrumentation and Controls, and should be submitted direct to Karl H. Norris, instrument news editor, 105A South Wing, Administration Bldg., Plant Industry Station, Beltsville, Md.

The author — HOLLIS SHULL — is agricultural engineer, Southwest Branch, Soil and Water Conservation Research Division (ARS), USDA, Brawley, Calif.

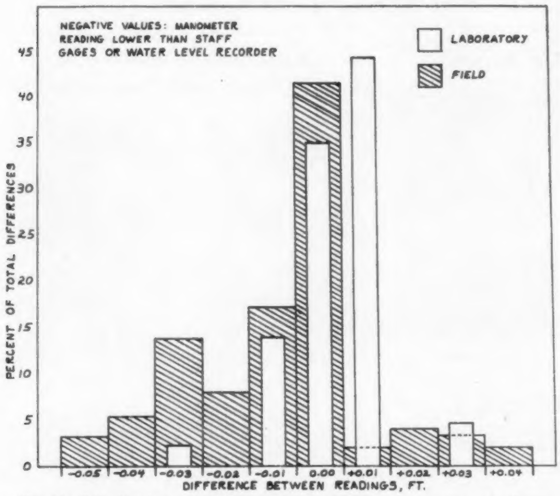

Fig. 2 Distribution of differences between manometer readings and staff gage or water-level recorder

water-level recorder was connected to the container that moved upwards. Manometer readings taken at selected time intervals were compared with water-level recorder data to determine the accuracy of the manometer. If the water-level recorder data were assumed to be accurate, differences would be manometer error. Several tests were made with different rates of increase of water level. Maximum rate of increase of water level was 0.034 ft per minute. Differences between manometer and water-level recorder data ranged from +0.027 to —0.025 ft; 93 percent of the differences were between +0.01 and —0.01 ft. Only two tubes were tested; however, it was assumed that the performance of the other tubes would have been similar.

Observations to determine field accuracy of the manometer were made by placing staff gages at four of the seven manometer tubing locations in the furrow. Manometer and staff gage readings were obtained at the same time for comparison. From a total of 152 comparisons, the differences ranged from +0.04 to —0.05 ft; with 91 percent of the differences between +0.03 and —0.03 ft, 74 percent between +0.02 and —0.02 ft, 62 percent between +0.01 and —0.01 ft and 42 percent of the comparisons gave no differences. If staff gage readings were assumed accurate, the differences were manometer error.

The accompanying histogram (Fig. 2) shows the frequency distribution of the differences between manometer readings and water-level recorder or staff gage readings by increments of 0.01 ft for both the laboratory and field comparisons, on a percentage basis.

Summary

Advantages of a manometer for measuring water-surface elevations in irrigated fields include simplicity and flexibility, the ability to measure relative water-surface levels from widely separated or inaccessible locations from one position, and reasonable accuracy. Disadvantages include possible errors due to air bubbles in the tubing lines leading to the field, limited usefulness when water levels are changing rapidly, and the requirement of constant attendance to obtain readings. Also, considerable time is required to pump water into the manometer when the tubing length is several hundred feet.

The manometer is a useful instrument for measuring water-surface elevations in irrigated borders and furrows when the rate of change of such elevation is slow and water velocities are low.

. . . Broiler Housing

(Continued from page 617)

gram weight of bird per hour. This may be a real problem in broiler housing.

Research Programs for Broiler Production Study

These are some of the major engineering problems in broiler housing. Recent federal authorization to study broiler condemnation losses will accelerate the study of poultry husbandry and diseases and the agricultural engineering aspects of broiler production. Laboratories will be located at Athens, Ga., and State College, Miss. The present calorimeters at Beltsville, Md., will continue to obtain information on poultry metabolism, production and other physiological inferences.

Summary

Federal poultry inspection data show that the largest broilers are produced in the fall and that condemnation increases in winter. The largest broilers are produced in the coolest areas and with the least condemnation. These generalizations indicate housing problems.

One of the chief difficulties in southern broiler houses in winter is the insufficient amount of insulation. Ventilation in these houses is necessarily restricted to conserve heat. A suggestion is made to insulate the existing buildings.

In summer the solar heat from the hot uninsulated roof is transmitted to the birds. A suggestion is made to increase air movement at bird level and in combination with fan and pad system to facilitate heat removal.

With "tightening up" of the house in the winter, a periodic field check of carbon dioxide, carbon monoxide and oxygen levels is needed and toxicity limits of poisonous gases should be established.

Since air movement materially affects heat dissipation, particularly of broilers, wind effects also need study.

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1962 NOMINATIONS ANNOUNCED

Nominee for President-Elect

J. W. BORDEN

Nominees for Vice-President

C. S. Morrison

R. R. Poynor

Nominees for Director — *Electric Power and Processing Div.*

C. W. Hall

K. H. Norris

Nominations for elective officers of the American Society of Agricultural Engineers for 1962-63 have been reported by the nominating committee: J. R. Davis (chairman); H. T. Barr; W. M. Carleton; H. J. Hansen; and J. B. Liljedahl. Voting will be by letter ballot which will be mailed to voting members in February. Ballot will close March 31. Nominees are as follows:

Nominee for President-Elect

J. W. (Wally) Borden, a native of Missouri, was born Nov. 14, 1916, in St. Louis. However, when he was quite young his family moved to Colorado Springs, Colo., where he received his early schooling. In 1938 he received a B.S. degree in civil engineering from the University of Colorado. For a short period after graduation he served as surveyor for the City Engineer at Colorado Springs, after which he spent 18 months in the Preliminary Arch Dam Design Section of the Bureau of Reclamation in Denver, Colo.

In 1940, intrigued with the prospect of living in California and learning aircraft design, he accepted a position as stress analyst at the Ryan Aeronautical Co. of San Diego. With the rapid pyramiding of the aircraft industry and the extreme shortage of trained aeronautical engineers, his next seven years were spent in various capacities including chief of structures, chief project engineer, chief administrative engineer, and assistant chief engineer. In 1947 he returned to Denver to pursue the sales field — one which he had always wanted to follow — by accepting the position of sales manager for Eversman Manufacturing Co. He subsequently became the company's vice-president in charge of sales and advertising, a position he still holds.

He joined ASAE in 1951 and has served the Society in various ways. He has been chairman of the Rocky Mountain Section, and served as chairman of the Drainage Group, Soil and Water Division. He also has served as a member of the Soil and Water Division Steering Committee, as well as chairman of the Motion Picture Finance Committee. In 1958 he was elected vice-president of the Society, his term expiring in 1961.

He has been a member of the American Society of Sugar Beet Technologists since 1958. He is a director of the Farm Equipment Institute, and has served as a member of its Soil and Water Conservation and Production and Marketing Committees.

Mr. Borden and his wife, Edith, have two daughters, two sons, and one grandchild. He is a member of the Presbyterian Church.

Nominees for Vice-President

Charles S. Morrison was born September 10, 1919, on a farm near Black Lick, Ohio. He received a B.S. degree in agriculture, in 1941, and a BAE degree in 1942, from Ohio State University. In 1946, he received an M.S. degree in agricultural engineering from Iowa State University. He has been employed in the product planning division of Deere & Company since 1946 and is now manager of product research and development departments. In this capacity he is responsible for supervising research and product planning activities on a wide variety of farm equipment problems. During World War II, he served as an electronics specialist in the U.S. Naval Reserves.

He has been an ASAE member since 1944, and has been active as chairman of the Power and Machinery Division, as well as chairman of the Quad City Section. He has served also as a member of the Committees on Research and ECPD Inspection. He is currently a member of the Committees on Standards, Forward Planning, and Finance.

He also is a member of the American Society of Metals and Society of Automotive Engineers.

Russell R. Poynor was born on September 13, 1913, in Waunakee, Wis., and was raised on a livestock farm in southern Wisconsin. He received a B.S. degree in agriculture in 1935 from the University of Wisconsin, a B.S. degree in civil engineering in 1937, also from the University of Wisconsin, and an M.S. degree in civil engineering from Purdue University in 1943. He was affiliated with the Soil Conservation Service in Wisconsin for one year; was a member of the engineering staff at Utah State University for three years; and was a member of the agricultural engineering department staff at Purdue University, where he did teaching and research, for five years. In 1945, he joined International Harvester Co. at its Canton Works engineering department. He was transferred to the company's general office in Chicago in 1947, as agricultural engineer in the Farm Implement Division. In 1953, he was appointed general supervisor of the farm practice research group, which became a part of the company's farm equipment product planning department in 1957. He is now general supervisor of farm equipment product planning research.

He has been an ASAE member since 1937, and has served as chairman of the Soil and Water Division, as well as on the following committees: Soil and Water Division Steering; ECPD Inspection; Mulch Tillage and Soil Compaction; and Publication Policies and Finances. He is also International Harvester's representative on the Agricultural Research Committee of the Farm Equipment Institute and is a member of the USDA Research Advisory Committee on Farm Equipment and Structures. He also is a member of the governing board of the Agricultural Research Institute and the Council for Agricultural and Chemergic Research, and is a registered professional engineer in the state of Indiana.

Nominees for Directors — *Electric Power and Processing Division*

Carl W. Hall was born on November 16, 1924, in Seneca County, Tiffin, Ohio. He received a B.S. degree in agricultural engineering from Ohio State University in 1948, an M.S. degree in mechanical engineering from the University of Delaware in 1950, and a Ph.D. degree in agricultural engineering from Michigan State University in 1952. From 1948 to 1951 he was an instructor and assistant professor of agricultural engineering at the University of Delaware. In 1952 he joined the agricultural engineering department staff at Michigan State University as assistant professor, and at present is professor of agricultural engineering.

He has been an ASAE member since 1948 and has served on several of its committees including the Education and Research Division Steering, Standards, Bulk Milk Cooling Systems, Monographs, and Publication Policies and Finances. He also has served as chairman of the Electric Power and Processing Division, as well as the Research Committee and the Agricultural Processing Committee. He has also served the Michigan Section as its vice-chairman. In 1958 he was a member of the USDA Scientific Exchange Delegation to the USSR, and has been correspondent for Section 4 (Materials Handling and Work Efficiency) of CIGR. In addition he has served as consultant to the University of Puerto Rico, the National University of Colombia, Palmira, South America, and the government of India.

Karl H. Norris was born May 23, 1921, in Glen Rickey, Pa., and was reared on a small general farm in this soft-coal area. In 1942 he received a B.S. degree in agricultural engineering from Pennsylvania State University. Immediately after graduation he joined International Harvester Co. in Chicago, Ill., but worked there only a few months before enlisting in the U.S. Army. He received special training in radio and electronics as part of his Army training

and when discharged in 1945 became a radio engineer with Airplane and Marine Instruments Co. In 1946 he received an appointment as an electronics engineer in the University of Chicago. He returned to the agricultural field in 1950 as a research engineer for the USDA Farm Electrification Section. He is now leader of the Instrumentation Research Laboratory, USDA Agricultural Marketing Service, Beltsville, Md.

He became a member of ASAE in 1942 and has served as Instrument News Editor for AGRICULTURAL ENGINEERING since 1952. In addition he has served as chairman of the Committee on Instruments and Controls and as a member of the Radiation Committee. He is currently vice-chairman of the Electric Power and Processing Steering Committee as well as the Committee on Research. He also is ASAE delegate to the Agricultural Societies Policy Committee, and ASAE alternate delegate to the Agricultural Research Institute.

Soil and Water Division

Talcott W. Edminster was born October 1, 1920, in East Freetown, Mass. In 1942 he received a B.S. degree in agricultural engineering from the University of Massachusetts, and in 1943 an M.S. degree in agricultural engineering from the University of Georgia. Following graduation in 1942 he was employed as field construction engineer with the Turner Construction Co. of Boston, Mass. He resigned this position in favor of continuing his education as a graduate research assistant at the University of Georgia. In 1943 he joined the staff at the Virginia Agricultural Experiment Station, Blacksburg, as an assistant agricultural engineer. He was transferred to the Soil and Water Conservation Research Branch, ARS, USDA, Beltsville, Md., in 1953. He served as assistant chief, Eastern Soil and Water Management Research Branch, and as work project leader for the federal drainage research program in the eastern 31 states. In 1960 he was appointed chief of the Branch and served in that capacity until the Division underwent a reorganization in March 1961. At that time he was made associate director of the Soil and Water Conservation Research Division.

He has been an ASAE member since 1942 and over the years has served the Society as vice-chairman of both the Southeast and the Virginia Sections; vice-chairman, as well as chairman, of the Soil and Water Division; and chairman of the Division's Steering Committee. He also has served as chairman of the Soil Compaction Committee and at present is a member of the Committee on Research. He also is the Soil and Water Division Technical Adviser to the Committee on Publication Policies and Finances. He represents the Society on the EJC Committee on Technical Planning, and is ASAE correspondent for Technical Section I (Soil and Water Sciences) of CIGR.

Ernest H. Kidder was born July 14, 1912, at Amiret, Minn. In 1935 he received a B.S. degree in agricultural engineering from the University of Minnesota, and in 1947 an M.S. degree in civil engineering from the University of Illinois. In 1935 he became affiliated with the Operations Divisions of the USDA Soil Conservation Service in Lanesboro and Plainview, Minn., and in 1940 he was transferred to the Research Division. From 1943 to 1945 he served in the U.S. Navy. From 1946 to 1948 he was affiliated with the Experiment Station staff at Urbana, Ill., as a hydraulic engineer. In 1948 and 1949 he was employed by the Research Division of the USDA Soil Conservation Service as project supervisor at Auburn, Ala. He joined the agricultural engineering department at Michigan State University in 1949 and is at present associate professor and head of the soil and water section.

Since becoming a member of ASAE in 1936, he has served the Society's Soil and Water Division as vice-chairman and chairman, as well as chairman of the Division's Steering Committee and its Irrigation Group. He also has been chairman of the Sprinkler Irrigation Committee, and served the Michigan Section as vice-chairman and secretary-treasurer.

Nominees for Nominating Committee —

Education and Research Division

Price Hobgood, head, agricultural engineering department, A. and M. College of Texas. Since becoming an ASAE member in 1938, he has served the Society in its Southwest Section as secretary-treasurer, vice-chairman, and chairman. At the present time he is chairman of the Curriculum and Course Content Committee of the Education and Research Division.

Clarence F. Kelly, chairman, agricultural engineering department, University of California. He has been an ASAE member since 1934 and has acted as chairman of the Farm Structures Division. At present he is a member of the Technical Advisory Committee on Plant and Animal Husbandry (joint with ASHRAE) and also is ASAE correspondent to Technical Section II of CIGR.

Electric Power and Processing Division

Robert H. Brown, professor of agricultural engineering, University of Georgia. He became a member of ASAE in 1950 and is at present serving as a member of the Electric Power and Processing Division Steering Committee and the Technical Subcommittee on Interior Wiring Design. He also has served the Georgia Section as vice-chairman and chairman. For four years he served as faculty advisor to the University of Georgia Student Branch.

Gerald W. Isaacs, professor of agricultural engineering, Purdue University, in charge of teaching and research in agricultural processing. He has been a member of ASAE since 1949 and has served on various committees including the Agricultural Processing Committee, Electric Power and Processing Division Steering Committee, and the Paper Awards Committee.

Farm Structures Division

Maurice L. Burgener, manager, Farm Bureau, Portland Cement Association, Chicago, Ill. Since becoming an ASAE member in 1948, he has served the Society as vice-chairman of the Farm Structures Division Steering Committee, as well as secretary of its Chicago Section. He also has been active as a member of the following committees: Standards; Animal Shelter Ventilation; Specifications for Installation of Concrete Pipe; and Farm Construction Standards. At present he is chairman of the Publication Policies and Finances Committee.

Donald W. Richter, senior sales engineer in charge of farm buildings, Armco Drainage and Metal Products, Inc., Middletown, Ohio. He has been an ASAE member since 1950 and has served the Farm Structures Division as secretary, and is presently chairman of its Steering Committee. He also is chairman of the Subcommittee on Materials of the Farm Building Construction Standards Committee, as well as a member of the Joint Committee on Animal Shelter Ventilation.

Power and Machinery Division

Benson J. Lamp, agricultural research engineer, Massey-Ferguson Limited, Detroit, Mich. He became a member of ASAE in 1950 and has served the Society as chairman of the Ohio Section and chairman of the National Meetings Committee. Currently, he is vice-chairman of the Michigan Section, program vice-chairman of the Power and Machinery Steering Committee, and a member of the Committee on Journal Paper Awards.

Keith L. Pfundstein, manager, agricultural engineering division, Ethyl Corp., Detroit, Mich. He has been a member of ASAE since 1947 and has served the Society as chairman of the Michigan Section; chairman of the Public Relations Committee, and has been active in various other committees.

Soil and Water Division

Gilbert Levine, associate professor, agricultural engineering department, Cornell University. He became an ASAE member in 1950, and is currently vice-chairman of the Committee on Sprinkler Irrigation. He is also a member of the Committee on Standards for Measuring Intake Rates of Soil for Irrigation Systems Design, and the Committee on Evapotranspiration.

Glenn O. Schwab, professor of agricultural engineering, Ohio State University, and the Ohio Agricultural Experiment Station. Since becoming an ASAE member in 1947 he has served as chairman of the Drainage Group, Soil and Water Division, and of the Drainage Research Committee. He also has been a member of the Course Content Committee, as well as other Soil and Water committees. At present he is a member of the Soil and Water Division Steering Committee and the Research Committee.

Nominees for Director — *Soil and Water Division*

T. W. Edminster

E. H. Kidder

Agricultural Engineering Subject Matter Classification

The Agricultural Engineering Subject Matter Classification as published by the American Society of Agricultural Engineers in the 1960 edition of the AGRICULTURAL ENGINEERS YEARBOOK (pages 379-392) is now available in reprint from the Society's headquarters, 420 Main St., St. Joseph, Mich. The price is 75 cents per copy; 25 copies or more are 50 cents each.

Bibliography on Pump Drainage with Abstracts

A "Bibliography of Pump Drainage with Abstracts," prepared by the ASAE Committee on Pump Drainage, is available from ASAE headquarters as paper No. 61-30. This Bibliography may be ordered by Technical Paper Order Form or for 50 cents a copy.

The Bibliography contains 11 pages including 59 listings. The Committee on Pump Drainage includes: C. L. Larson (chairman), K. R. Klingelhofer, G. B. Fasken, J. C. Stephens, L. W. Herndon, R. W. Irwin, Virgil Marvin, T. L. Willrich, K. V. Stewart, and R. L. Green.

AGRICULTURAL ENGINEERING EXPOSITION

December 12, 13 and 14 — 2:00-9:00 p.m. • In Conjunction with ASAE Winter Meeting

A total of 36 organizations occupying 42 booths are participating in the first ASAE-endorsed Agricultural Engineering Exposition. Following is a description of exhibits, including type of display, names of personnel who will staff booths, and a listing of available literature.

***Acme Chain Co. (Booth 4).** *On Display* — Agricultural chain drive applications, and samples of products. *Personnel* — Ben Winburn, John Hayden, Robert Holmes, Gene Norene, Fred Johnson, and Donald Pihl. *Literature* — Catalog and special folders on agricultural chain drives.

American Society of Agricultural Engineers (Booth 94). *On Display*—Literature counter. Illustrations documenting the significance of engineering in agriculture, as engineering has developed technology providing increased agricultural productivity. The contribution of engineering to agriculture, and the role and growth of ASAE as paralleled with this progress in agriculture and technology. *Personnel* — Mrs. Barbara Brown, ASAE headquarters personnel, and members of ASAE Board of Directors. *Literature* — Promotional pieces and membership information.

The Brown-Brockmeyer Co. (Booth 46). *On Display* — Samples of electric motors, bench grinders, and gears. *Personnel*—A. G. Bickford, D. G. Panuce, and T. J. Diehl. *Literature* — Descriptive Bulletins 170 and 870.

Carlisle Tire & Rubber Div., Carlisle Corp. (Booth 75). *On Display* — Transmission and gated irrigation tubing and accessories, including pump connections, caps, and reducing sections; also ditch dams and materials for lining canals. *Personnel*—Harold Stovell, Ted Conklin, Ivan D. Wood, C. J. Gerker, and F. R. Olson. *Literature* — Descriptive pieces on irrigation materials.

***Chain Belt Co. (Booth 95).** *On Display* — Chain and chain applications, and universal joints, with photos of roller and agricultural implement chain. *Personnel* — Vern Benson, Ed Paul, Frank Dodge, Paul Oviatt, and Fred Potgieter. *Literature*—Catalog on agricultural chain and universal joints.

Crucible Steel Co. (Booth 78). *On Display* — Soft center and solid plow steel, coulter blades, seeder discs, plow and harrow discs; also samples of free machining steels. *Personnel* — W. B. Jones, D. G. Genter, J. W. Rubin, and H. Sulser. *Literature*—Brochure on agricultural steels.

Dana Corp. (Booth 47). *On Display* — Agricultural universal joints, both shielded and unshielded, and split-torque and dual drive clutch.

***Rubber Products Div., Dayco Corp. (Booths 66, 67).** *On Display* — Agricultural V-belts. *Personnel* — T. E. Farrell, N. G. Lever, J. J. Sly, W. O. Terrill, W. F. Moore, and W. T. McEnery.

***Diamond Chain Co., Inc. (Booth 76).** *On Display* — Roller chains, sprockets and couplings, as well as new idler sprocket, and double pitch power transmission roller chains; also running displays of couplings and idler sprockets. *Personnel*—R. W. Napp, J. L. Cartmell, R. E. Kessler, E. C. Hauck, and R. F. Curry. *Literature* — Bulletin 1060-C on couplings; data sheet on idler sprockets; and Product Catalog No. 760.

***The Fafnir Bearing Co. (Booth 68).** *On Display* — Radial ball bearings and housed units for use on agricultural equipment. *Personnel* — C. W. Olson, R. W. Powell, N. B. Bagger, J. J. Matukas, F. E. Palmer, and R. W. Smith. *Literature*—Product data sheets and folders on specific bearing types, and bearing catalogs.

Farm Equipment Institute (Booth 80). *On Display* — Educational printed matter outlining the activities of FEI. *Personnel* — J. L. Dreyer. *Literature* — Booklets, "Tips for Safe Tractor Operation," "Land of Plenty," and "Our Future Is Linked Together," and others on committee and institute activities.

Heli-Coil Corp. (Booth 45). *On Display* — Standard and screw lock inserts protecting threads in all materials. (Grip Nut Co., subsidiary of Heli-Coil, centerlock nuts, weld nuts and specialty fasteners.) *Personnel* — Robert Rodgers, Hiland Hall, and William Bastian. *Literature*—Pieces on display products.

Hypro Engineering, Inc. (Booth 60). *On Display* — Hypro pump line with emphasis on agricultural spray pumps. Working pump display. *Personnel* — Conrad Letourneau, Jim Wirth, and George Worthington. *Literature* — Individual leaflets on hypro pumps with product information.

***The Kaydon Engineering Corp. (Booths 52, 53).** *On Display*—Precision ball, roller, and needle bearings, and needle rollers. *Personnel* — D. C. Maxwell, Warren Klinkner, Ernest Jensen, Richard Pryor, Edward Konkol, W. B. Campbell, and Don Petersen. *Literature* — Catalogs and bulletins on precision loose needle rollers, needle bearings, recirculating roller bearings, thrust needle bearings, ball and roller bearings.

***Link-Belt Co. (Booth 61).** On Display — Chains, augers and bearings for the agricultural industry. *Personnel* — Carl Rudman, Boyd Farmer, Jesse L. Miller, Robert A. Sochar; Arthur J. Bruce, and William T. Kraemer.

***Minneapolis - Honeywell Regulator Co. (Booth 77).** *On Display* — Controls for the modern farm. *Personnel* — C. W. Sweatt, Jr., L. L. Hamilton, R. I. Smith, A. I. Curtis, D. B. Bolin, and Dave Louks. *Literature* — Brochure No. 52-0011 (controls for the modern farm) and No. 52-0003 (controls catalog).

Morse Chain Co., A Borg-Warner Industry (Booth 44). *On Display*—Power transmission products. *Personnel* — A. J. Zoppi, George Simons, Lyle Wegner, Donald Kucharo, and Clyde M. Koehn. *Literature* — Full line products catalog and single product catalogs.

Frank W. Murphy Manufacturer, Inc. (Booth 79). *On Display* — Safety switch-gauges for tractors and irrigation equipment. *Personnel* — G. B. Schapaugh, Don Altman, and Frank W. Murphy.

***Neapco Products, Inc. (Booth 3).** *On Display* — Needle roller and plain bearing universal joints and drive shaft assemblies. *Personnel* — R. E. Jeffries, G. G. Kochel, Carl T. Ressler, R. G. Holmes, and F. K. L. Johnson. *Literature* — Catalogs and engineering bulletins, and file folder of yoke drawings for design tracings.

***New Departure Div., General Motors Corp. (Booth 106).** *On Display* — Ball bearings for farm equipment, cutaway application models and a ball bouncer. *Personnel* — H. A. Offers, R. J. Lynch, J. T. Baker, R. M. Arend, J. C. Morton, L. S. Zaleski, J. S. Besemer, L. H. Nordstrom, A. L. Swanson, M. C. Wagner, and C. T. Bragdon. *Literature* — Agricultural ball bearing catalog.

***Nice Ball Bearing Co. (Booth 63).** *On Display*—Standard and special ball bearings for farm machinery; special bearings for cam followers, belt idlers, disk bearings, flange mounted assemblies, and wire guides. *Personnel* — T. E. Spence, A. R. Spiacci, J. E. Ellis, R. A. Cottle, A. R. Freed, T. J. Gordon, and R. E. Thomas. *Literature* — Full line catalog (190); farm machinery catalog (FM100); and special farm implement bearing bulletins.

The Ohio Nut & Bolt Co. (Booth 59). *On Display* — Fasteners, nuts, screws, brackets, pins, pads, knobs, and handles designed for resistance welding; also applications and recommended welding electrodes. *Personnel* — G. F. Nolan, J. W. Ove, and J. T. Doheny. *Literature* — Bulletin 621 describing weld fasteners.

Pelco Structures Inc. (Booth 48). *On Display* — Hand tools, and automatic slide projector showing examples of the company's work as a specialty contractor or sales-contractor to metal building industry. *Personnel* — Peter C. Coates, Daniel Van Buskirk, Walter Lund, and David J. Youngman.

Perfection Gear Co. (Booth 5). *On Display* — Gears, gear boxes, and torque limiters. *Personnel* — Arthur Jacobs, Robert Holmes, and Fred Johnson.

***Portland Cement Association (Booth 2).** *On Display* — New designs in concrete farm structures, including folded plate roofs, tilt-up buildings, hyperbolic paraboloid roofs, and precast products. *Personnel* — Maurice L. Burgener, William V. Wagner, Jr., and William D. Hanford. *Literature* — How-to-do-it booklets on new designs and other concrete farm improvements.

***Roberts Mfg. Co. (Booth 6).** On Display — Pillow block, take-up and stamped bearings, flange and special bearing units; also pictures of equipment. *Personnel* — Q. A. Applequist, A. H. Snyder, Jr., and W. Y. Dabney, Jr. *Literature* — Descriptive data sheets on company's products.

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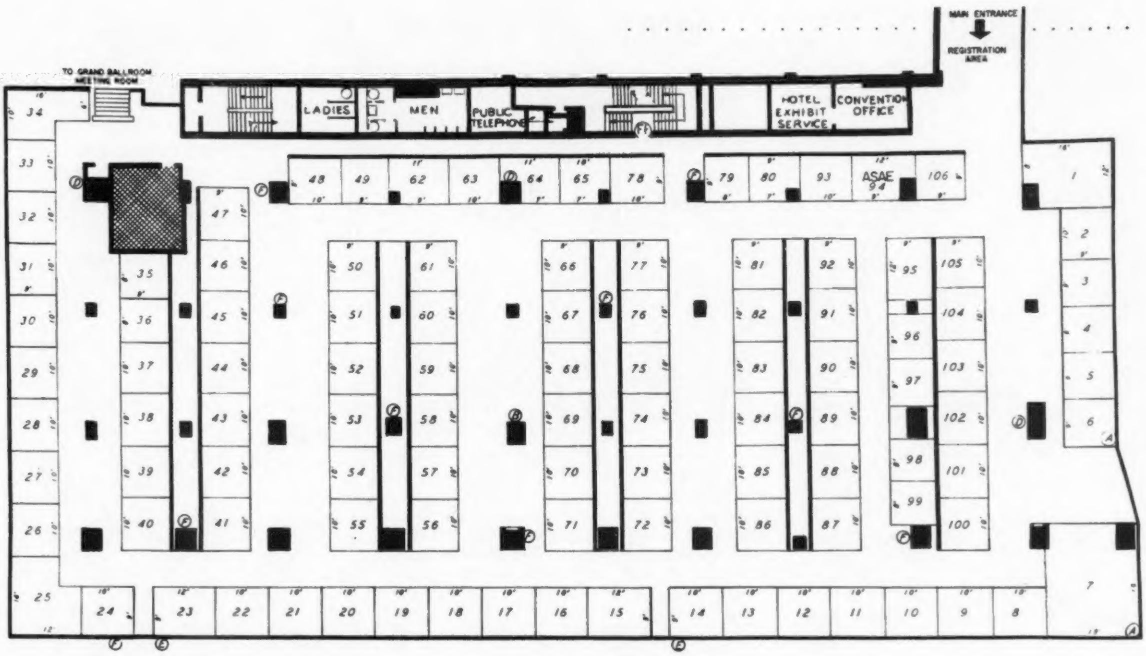
*Advertisers in this issue.



FLOOR PLAN OF EXHIBITS

PARTIAL EXHIBITOR LIST

Booth No.

2. Portland Cement Assn.
3. Neapco Prducts, Inc.
4. Acme Chain Corp.
5. Perfection Gear Co.
6. Roberts Mfg. Co.
34. The Torrington Co.
44. Morse Chain Co., A Borg-Warner Industry
45. Heli-Coil Corp.
46. The Brown-Brockmeyer Co.
47. Dana Corp.
48. Pelco Structures Inc.
50. Warner Automotive Div., Borg-Warner Corp.
51. Wooster Div., Borg-Warner Corp.
52. The Kaydon Engineering Corp.

Booth No.

53. The Kaydon Engineering Corp.
59. The Ohio Nut & Bolt Co.
60. Hypro Engineering, Inc.
61. Link-Belt Co.
63. Nice Ball Bearing Co.
66. Rubber Products Div., Dayco Corp.
67. Rubber Products Div., Dayco Corp.
68. The Fafnir Bearing Co.
75. Carlisle Tire & Rubber Div., Carlisle Corp.
76. Diamond Chain Co., Inc.
77. Minneapolis-Honeywell Regulator Co.
78. Crucible Steel Co.
79. Frank W. Murphy Manufacturer, Inc.
80. Farm Equipment Institute
81. The Timken Roller Bearing Co.
82. The Timken Roller Bearing Co.

Booth No.

90. Universal Joint Div., Rockwell-Standard Corp.
91. Universal Joint Div., Rockwell-Standard Corp.
92. Wisconsin Motor Corp.
93. Stephens-Adamson Mfg. Co.
94. American Society of Agricultural Engineers
95. Chain Belt Co.
96. Saginaw Steering Gear Div., General Motors Corp.
97. Saginaw Steering Gear Div., General Motors Corp.
103. United States Steel Corp.
104. United States Steel Corp.
105. United States Steel Corp.
106. New Departure Div., General Motors Corp.

Universal Joint Div., Rockwell-Standard Corp. *(Booths 90, 91). *On Display* — Combine axles, garden tractor transmission, universal joints and drive lines. *Personnel* — Don Wilber and Bill Shirley.

Saginaw Steering Gear Div., General Motors Corp. *(Booths 96, 97).* On Display — Ball bearing screws and splines; manual and power steering for trucks and tractors; and hydraulic pumps for power steering systems. *Personnel*—Robert J. Kline, Robert Wilder, Dave Smith, Mark McCabe, and Harry Hawkins. *Literature* — Engineering data book on the ball bearing screw and spline.

Stephens-Adamson Mfg. Co. *(Booth 93).* *On Display* — Industrial housed ball bearings and spherical rod ends and bearings for use on agricultural equipment. *Personnel*—C. B. Hurd, G. I. Marsh, and R. Glavan. *Literature* — Catalogs on company's products.

*Advertisers in this issue.

The Timken Roller Bearing Co. *(Booths 81, 82). *On Display* — Many sizes and types of company's tapered roller bearings used in the farm industry; also a comparison between agricultural costs in a 1950 and a 1961 tractor. *Personnel* — R. G. Morgan, F. J. Hartshorn, Jr., A. F. Campbell, H. L. Parent, A. S. Eichman, R. P. Clemmer, D. L. Van Orman, B. C. Price, R. E. McKinney, R. K. McConkey, W. E. McCoy, S. M. Weckstein, F. R. MacFadyen, A. J. Jenkins, R. P. Koons, J. H. Fellows, and H. C. Shepard. *Literature* — Timken Engineering Journal (Sections I, II, and Farm Equipment Section), Bearing Buyers Bible, and booklet "No Trouble at All."

The Torrington Co. *(Booth 34).* *On Display* — Needle, needle thrust, drawn cup roller, heavy duty roller, and spherical roller bearings; cam followers; and self-aligning ball bushings; also farm implement, gear pump, and heavy duty transmission applications. *Personnel* — B. T. Virtue, J. R. Hull, R. G. O'Connell, Gerry Gehrke, John Heyvaert, R. U. Sautter, David Anthony, Frank Stefanov, R. A. Peterson, and Gordon Duncan. *Literature* — Bearings catalogs.

United States Steel Corp. *(Booths 103, 104, 105).* *On Display* — Application of steel to farm machinery and structures, mainly such steels as high-strength, corrosion resistant, alloy, and steel tubular products. Also, galvanized steels for irrigation, stainless steel for liquid fertilizer applications and plastic pipe. (American Steel and Wire Div. booth—spring wire.) *Personnel*—Paul Strom, Wayne Maley, Robert Rowe, Ivan Bigalow, and S. S. DeForest. *Literature* — Samples pertinent to application of these steels to farm machinery (by request card).

Warner Automotive Div., Borg-Warner Corp. *(Booth 50). *On Display*—Agricultural implement gear box drives, tractor power take-offs, and differentials. *Personnel*—P. A.

(Continued on page 630)

New Features Planned for Winter Meeting

December 12-15
Palmer House, Chicago

THE 1961 Winter Meeting of the American Society of Agricultural Engineers will be held December 12 to 15 at the Palmer House Hotel in Chicago, Ill. Registration will begin at 2:00 p.m., Tuesday, December 12, on the 4th floor foyer. Advance registration cards and hotel reservation forms have been mailed to ASAE members. Non-members interested in attending the meeting should communicate with the central office of the Society at St. Joseph, Mich., for information on accommodations and the program of the meeting sessions. A Cabinet Meeting will be held Tuesday, December 12, at 8:00 p.m. in the Wabash Parlor, 3rd floor.

Special Features

In addition to the usual program of technical sessions, several new features have been added this year. Introduced for the first time in ASAE history is an ASAE-endorsed Agricultural Engineering Exposition. Further details may be found on page 626. Also, a special program entitled "Tooling Up for Systems Farming," which is sponsored jointly by ASAE and the Farm Equipment Institute, will be held one day preceding the Winter Meeting. This new feature replaces the usual FEI "Dinner for Professors" program (see third column).

Special evening programs have been planned to utilize early evening hours in the form of open forums on Wednesday and Thursday evenings at 8:00 p.m. (see details elsewhere on this page). In conjunction with the open forums several invitations have been extended to manufacturers of outstanding propulsion machines to display "machines of tomorrow." Some have accepted and further effort is being made to contact others. From advance reports these specially invited exhibits should attract much attention.

Of special interest to those associated with grain and feed processing and storage are two sessions sponsored jointly by the Farm Structures and Electric Power and Processing Divisions, in cooperation with the Grain Processing Machinery Manufacturers Association, The Feed Production School, Inc., and the American Feed Manufacturers Association (see third column). Also, the Personnel Service Contact session will be held on Wednesday afternoon.

Technical Sessions

The technical sessions will open on Wednesday morning, December 13, with five concurrent sessions — two Power and Machinery programs (general and tire studies), a Soil and Water on soil erosion, an Electric Power and Processing on rural electrification, and a joint Farm Structures and Electric Power and Processing on grain storage. Wednesday afternoon will be devoted to the following sessions: Joint Electric Power and Processing and Farm Structures on grain and feed processing; two Power and Machinery — one on testing and the other on aircraft chemical application; Soil and Water on drainage; and Farm Structures on poultry environment.

The subjects to be presented on the five concurrent sessions scheduled for Thursday morning are: Farm Structures — farm building construction; Electric Power and Processing — instrumentation handbook; Power and Machinery (two sessions) — hay pelleting and farm machinery management; and Soil and Water — irrigation.

The technical sessions will continue on Friday morning with five concurrent programs consisting of: Soil and Water on hydrology; Farm Structures on farmstead; Electric Power and Processing on controls; Power and Machinery (two programs) on tractors and row spacing. Four concurrent sessions on Friday afternoon will conclude the three-day meeting. Papers will be presented on the following topics: Electric Power and Processing — materials handling; Power and Machinery (two programs), tractors and tillage; and Farm Structures — dairy and hog buildings and environment.

General Session

The theme of the General Session on Thursday afternoon is "The Next 10 Years — Challenge and Response." The featured speakers at this session will be R. J. Martin, director, Engineering Experiment Station, University of Illinois, who will address the group on research for the future of universities and industry, and N. A. Hall, chairman, Mechanical Engineering Department, Yale University, whose topic will be engineering education, forecasts and trends.

Open Forums and "Machines of Tomorrow"

AN added feature of the Winter Meeting program is a series of open forums to be conducted on consecutive evenings, December 13 and 14. During the first evening, four such programs will be conducted concurrently beginning at 8:00 p.m. The Power and Machinery Division will discuss outstanding propulsion machines; the Farm Structures Division will discuss program planning committee for farm structures; and the Electric Power and Processing Division will discuss particle size analysis and classification. The Research Committee of the Education and Research Division has selected "Recent Advances in Microclimatology Research on Plants and Animals and Their Relation to Agricultural Engineering" as its subject. C. B. Tanner, soils department, University of Wisconsin, will discuss plants, and T. E. Bond, agricultural engineer, ARS, USDA, will discuss animals.

In connection with the Power and Machinery Division forum Wednesday evening, several companies have been invited to display any new developments that might be considered as, or forerunners, of "machines of tomorrow." Advance reports indicate that some outstanding displays are being arranged.

On Thursday evening four open forums again will be conducted. The Power and Machinery Division has selected as its topic "Forage Harvesting and Utilization," and the Electric Power and Processing Division will discuss program planning. T. D. Fontaine of the National Science Foundation will introduce the topic "The Fellowship Program of the National Science Foundation" in the third forum. As the fourth forum, the Education and Research Division will present an extension program entitled "Field Days and Field Demonstrations." Representatives of industry and public agency groups will discuss the following questions concerning cooperative and adult education programs on demonstrating new practices, recent research, new equipment or techniques: How valuable are field days and demonstrations?; how should they be set up?; and what should they achieve? R. L. Maddex, extension agricultural engineer, Michigan State University, will preside. C. W. Saldeen, Tractor and Implement Division, Ford Motor Co., Guy Woodward, Utah State University, and M. T. Fast, Douglas Fir Plywood Association, will represent industry. B. S. Horne, Pennsylvania State University; H. B. Goolsby, Georgia Agricultural Extension Service, and W. H. Peterson, South Dakota State College, will represent public agencies.

ASAE-FEI to Hold Meeting on Systems Farming

A SPECIAL program entitled "Tooling Up for Systems Farming" will be held December 12, one day preceding the ASAE Winter Meeting at the Palmer House in Chicago. Sponsored jointly by the American Society of Agricultural Engineers and the Farm Equipment Institute, the conference has been planned to review new developments in mechanizing materials handling from harvest through final disposition. Speakers will present the advantages and hazards involved in adapting mechanization in the area of systems farming.

The Joint Planning Committee is composed of ASAE members A. W. Farrall, head, agricultural engineering department, Michigan State University; R. R. Poynor, general supervisor, farm equipment product planning research, International Harvester Co.; and C. B. Richey, chief research engineer, Tractor and Implement Division, Ford Motor Co.; and FEI representatives, S. G. Burritt, president, Starline Inc.; R. L. Crom, general manager, Farm Equipment Division, Butler Manufacturing Co.; and M. L. Lorenzen, president, Hawkeye Steel Products Inc. It has been pointed out by the committee that to be truly efficient each new piece of equipment and each new management practice must be linked together in a way to bring the farmer the greatest possible return for the additional capital investment he will make in mechanization. The purpose of the conference is "to show how to fashion this chain of efficiency."

Registration will begin at 9:00 a.m., Tuesday, December 12. Byron T. Virtue, president of ASAE, and consultant, Bearings Division, The Torrington Co., will preside. Karl D. Butler, agricultural consultant, will discuss a systems farming concept; Henry J. Barre, consulting engineer, will report on case studies — systems that are working for farmers; and Glenn Rittenhouse, president, Illinois Retail Farm Equipment Association, will describe a

dealer's role in merchandising systems farming. Willis G. Scholl, president, Farm Equipment Institute, will preside during the luncheon program. Roy N. Van Arsdall, agricultural economist, ARS, USDA, as luncheon speaker, will present the economic requirements of systems farming.

The afternoon program will include: Financing Systems Farming, by James Shute, assistant secretary, Northern Trust Co., and Manufacturers' Stakes in Systems Farming, by Robert R. Rowe, United States Steel Corp. A summary of the conference will be presented by Roy Bainer, associate dean of engineering, University of California.

Pennsylvania Grassland Conference

The second annual Pennsylvania Grassland Conference will be held on November 20 and 21 in the Assembly Room of the Nittany Lion Inn at The Pennsylvania State University. This conference is sponsored by The Pennsylvania Grassland Council and The Pennsylvania State University. The Monday afternoon program, chairmaned by ASAE member B. S. Horne of the agricultural engineering department, The Pennsylvania State University, will include the following topics: Agricultural Extension and the Grassland Council, by H. R. Albrecht; An Economist Looks at Grasslands, by W. E. McDaniel; Cover Crops Protect Your Soils, by W. A. Hayes; and Manage Those Forage Crops, by J. B. Washko and J. E. Baylor. The subject of an address on Monday evening by F. H. Hamlin, ASAE member and president of Papec Machine Co., will be "Partners."

The Tuesday morning program will include the showing of a film entitled "Cash in on Grass," as well as discussions on profits start with good stands, by R. E. Wagner; the potential of haylage as an ensiling method, by C. H. Gordon; and cattle disorders attributed to forage, by S. B. Guss. A panel forum will close the Tuesday morning program, when F. A. Hughes will act as moderator on the subject "Four Roads to Profitable Pasture." The four panelists will be C. K. Gordon (Rotation Grazing), Merle Zimmerman (Ration Grazing), Alvin Houck (Zero Grazing), and Ralph Dotterer (Zero Grazing and Stored Feeding). The closing program on Tuesday afternoon will include a presentation by ASAE member M. E. Singley, chairman, agricultural engineering department, Rutgers University, on modern methods of handling forage, and one on the latest developments in forage evaluation, by J. W. Bratzler. Progress reports in grassland research also will be given, including insect control in forage crops, by J. O. Pepper, wafering high moisture hay, by A. S. Gustafson, pelleted forages for sheep, by R. L. Cowan, and effect of forage maturity on yield and quality, by E. M. Kesler.

EVENTS CALENDAR

November 17-23 — *Farm-City Week.*

November 20-21 — *Second Annual Pennsylvania Grassland Conference,* Assembly Room, Nittany Lion Inn, Pennsylvania State University, University Park, Pa.

November 27-30 — *Annual Meeting of the American Society of Agronomy,* Sheraton-Jefferson Hotel, St. Louis, Mo. Write to ASA, 2702 Monroe St., Madison 5, Wis., for information.

November 28-30 — *Building Research Institute 1961 Fall Conferences,* Mayflower Hotel, Washington, D.C. BRI, 2101 Constitution Ave., N.W., Washington 25, D.C.

January 8-12 — *SAE Automotive Engineering Congress and Exposition,* Cobo Hall, Detroit, Mich. Obtain information from Society of Automotive Engineers, Inc., 485 Lexington Ave., New York 17, N.Y.

January 22 - February 1 — *Engineering and Management Short Course,* University of California, Los Angeles. For further information write to Reno Cole, Course Coordinator, University Extension, University of California, Los Angeles.

January 29 - February 1 — *American Society of Heating, Refrigerating and Air-Conditioning Engineers Semiannual Meeting,* The Chase-Park Plaza Hotel, St. Louis, Mo. Details may be obtained from ASHRAE, 345 E. 47th St., New York 17, N. Y.

February 11-17 — *National Electrical Week.* Write to National Electrical Week Committee, 290 Madison Ave., New York 17, N. Y., for information.

February 12-13 — *Fertilizer Technology Short Course,* Purdue University, Lafayette, Ind. Sponsored by the Soil Science

(Continued on page 639)

Special Grain and Feed Sessions Planned

During a recent Feed Production School, members of ASAE, Grain Processing Machinery Manufacturers Association and American Feed Manufacturers Association took time out to review the program for joint sessions planned for ASAE Winter Meeting. Shown are two examples. At left are *(left to right)* GPMMA President C. Robert Myers, AFMA President E. Glennon, and H. B. Puckett, AERD, ARS, USDA, Urbana, Ill., speaker at Feed Production School. At right are *(standing left to right)* D. F. Shimon, Butler Mfg. Co., H. B. Pfost, professor of flour and feed milling industries, Kansas State University, and *(seated)* C. Robert Myers, president of Myers-Sherman Co. and GPMMA. H. B. Pfost is chairman of the planned program and D. F. Shimon will be chairman of a like program to be held at the ASAE Annual Meeting in June 1962

A FULL day of technical sessions will be sponsored cooperatively by the ASAE, the Grain Processing Machinery Manufacturers Association, The Feed Production School Inc., and the American Feed Manufacturers Association on Wednesday, December 13, during the ASAE Winter Meeting. The theme for the morning session is entitled "Grain Storage," and will be presided over by H. B. Pfost, professor, department of flour and feed milling industries, Kansas State University. The program will consist of the following presentations: Opportunity is knocking louder, by G. A. Karstens; commercial grain storage facilities, by M. C. Bondus; moisture content, storage molds and grain quality, by C. M. Christensen; what agricultural engineers can do for the wet and dry corn milling industry, by W. R. Wichser; drying corn for the commercial market, by G. H. Foster; and flow of granular materials in bins, by A. W. Stegner and Alan Cook.

The afternoon program will be presided over by H. J. Barre, consulting engineer, Worthington, Ohio. The following subjects will be covered in line with the theme "Grain and Feed Processing": The structure of grain kernels and its importance to engineers, by M. M. MacMasters; feed mixing and segregation problems, by R. C. Wornick; the design of feed plants for producing feed for nutrition research, by T. E. Stivers; the need for equipment and test standards for processing machinery, by Ralph Williams and George Thomas; production organization for specification products, by L. V. Burns and D. R. Landphair.

Oliver-Cockshutt Merger Planned

It has been announced in a joint statement from The White Motor Co. and Cockshutt Farm Equipment Limited that negotiations are under way to bring about an amalgamation of the farm equipment operations of the two companies. Oliver Corp. of Chicago, a subsidiary of The White Motor Co., manufactures farm equipment in the United States and Cockshutt Farm Equipment Limited is a Canadian manufacturer of farm equipment. Their products would continue to be marketed separately through existing dealer organizations and production would continue at the Cockshutt plant in Brantford, Ontario, Canada.

Southwide Mulch Tillage Workshop

"Mulch Tillage Can Boost Farm Income, Conserve Soil and Water" was the theme of a Mulch Tillage Workshop held November 14 to 16 at the New Perry Hotel, Perry, Ga., for personnel of the USDA Soil Conservation Service and the farm equipment industry in ten southeastern states (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia). The purpose of the workshop was to train designated personnel of the Soil Conservation Service in the practice known as "mulch tillage" for the treatment of cropland as a part of a complete soil and water conservation farm plan to the extent that they would be able to formulate plans, conduct demonstrations, and otherwise promote mulch tillage in the states they represented. Because of the importance of certain types of equipment required for applying this practice, representatives of the farm equipment industry were invited to participate in the workshop. Meeting sessions were held at the New Perry Hotel, and the remaining time was devoted to field work on the S. A. Nunn farm near Perry.

Farm Structures Day Held

Reports on experimental precast concrete buildings and slatted floors for livestock shelters highlighted this year's University of Illinois Farm Structures Day program, held Thursday, November 16, in Urbana. Other high interest features of the program included discussions on long-span wood construction, lumber rigid frames, coated fiberboard lining for wet corn storage and applications of concrete for livestock buildings.

Hay Wafering Machine Rights Sold

According to an announcement made by Vernon Lundell, president of Lundell Mfg. Co., Inc., Cherokee, Iowa, world manufacturing and marketing rights to a field hay wafering machine have been sold to Massey-Ferguson, Ltd. However, Lundell reports that Lundell Mfg. Co. will continue to manufacture its own wafering machines in the United States under license from Massey-Ferguson. He also said that the complete line of company equipment will be manufactured and marketed as in the past and that the sale of the wafering machine manufacturing rights will not change company policies. Also, the association of Lundell Mfg. Co., Inc. with the Lundell Great Britain Ltd. firm will remain the same.

SDSC Agricultural Engineering Curriculum Accredited

Dennis L. Moe, head of the agricultural engineering department at South Dakota State College, reports that its agricultural engineering curriculum has been accredited by the Engineers Council for Professional Development. The addition of South Dakota State College to the list of institutions whose agricultural engineering curriculums have been duly accredited by ECPD brings the total to 32. Fifteen additional colleges and universities of the United States and Canada offer professional curriculums in agricultural engineering or their engineering equivalent, and are considered working toward the ECPD standard.

New Feed Production Handbook

A new Feed Production Handbook, containing 288 pages, has been published by Feed Production School, Inc., with Harry B. Pfost, professor of flour and feed milling, Kansas State University, as editor-in-chief. This book, a first edition, represents the first authoritative textbook of modern feed production to be compiled. It was undertaken primarily to aid feed production personnel in building a more efficient and profitable operation, despite the ever-growing complexity of the industry, and will also be used as a reference text in industry training programs and in college courses, according to H. B. Pfost.

Many critical phases of feed production are explored in this volume, resulting in practical recommendations for meeting a variety of circumstances and requirements. It contains the following chapters: The Formula Feed Industry; Feed Production Terminology; Basic Processing Operations; Process Flow Design; Plant Layout and Design; Equipment Standards; Operating Standards: Record Systems for Operating Control; Products Control; Bulk Dry Materials Handling and Storage; and Packaged Materials Handling and Storage. It is available from Feed Production School, Inc., 20 W. Ninth Street Building, Kansas City 5, Mo. The price is $25.00.

Land and Water Use Symposium

ASAE is one of the co-sponsors of a Land and Water Use Symposium (with special reference to mountain and plains regions) sponsored by Section O (Agriculture) of the American Association for the Advancement of Science in cooperation with other societies. It will be held during the AAAS annual meeting December 27 to 30 at the Hilton Hotel, Denver, Colo. The program will be centered on the currently vital topic of the use of public lands, the interrelations of land use with water supply, water management, and the general welfare of the nation, with papers arranged to bring out broad policy issues.

"Land and Water Resources" will be the theme of the session to be held the morning of December 27 when the following papers will be presented: Population Demands for Land and Water Resources of the Western Hinterland; Land Resources and Potential Use; Water Resources, Development and Uses; and Public Grazing Lands in the Economy of the West. The afternoon session will cover the theme "Optimum Uses for Resources" when four specific topics will be discussed — Criteria and Planning for Optimum Use; Economic Priorities on Water Use in Arid Regions; Agriculture as a Competitive Segment of Multiple Use; and Recreation as a Competitive Segment of Multiple Use.

The Symposium will continue on December 29 when the morning session will be devoted to Impact of Public Policy on Land and Water Use, with discussions on the government's responsibility for land and water; problems and policies associated with wilderness areas and other reserves of public lands; problems growing out of the spaciousness of the west; and public and/or private investment in resource development. In line with the program topic "Projecting Management Programs" for the afternoon session four specific subjects will be discussed — Providing for Multiple Use in Managing Land and Water, Modifying Management and Vegetation of Watershed Areas for Improved Water Yields; Management Associated with Complex Use for Wildlife, Livestock, and Recreation; and Managing Private Lands in Relation to Changing Uses of Public Lands.

. . . AE Exposition

(Continued from page 627)

Moody, D. C. Hamilton, S. H. Mieras, Vince Miller, E. F. Long, J. Holdeman, B. Tharpe, and V. Tharpe. *Literature* — Complete catalog covering company's line of implement gear drives.

Wisconsin Motor Corp. *(Booth 92). *On Display* — Heavy duty air-cooled engines (single, two and four cylinder models, 3 to 60 hp); and new model valve-in-head engine. *Personnel*—Phil Norton, Ray Fellows, J. W. Perschbacher, Joe King, H. A. Todd, and Tom Barrett. *Literature*—Brochures on engines (S-282, S-283, and S-285).

Wooster Div., Borg-Warner Corp. *(Booth 51).* On Display—Hydraulic motors, pumps, and valves; also a working plastic model of a system demonstrates operating principles. *Personnel* — Ralph J. Mast and Norbert W. Horn.

During Feed Production School at the Hotel Continental in Kansas City, Mo., September 13, ASAE members in attendance held a special luncheon. A total of 22 were in attendance, only three of whom were not ASAE members. P. N. Doll, executive director, Missouri Society of Professional Engineers, served as toastmaster. H. B. Pfost, professor of flour and feed milling, Kansas State University, and J. H. Wessman, secretary-treasurer, Grain Processing Machinery Manufacturers Association, described the special grain and feed processing program planned for ASAE Winter Meeting. See details on page 629

Two Governors Speak During Pacific Northwest Section Meeting, October 18-21

George D. Clyde
Governor of Utah

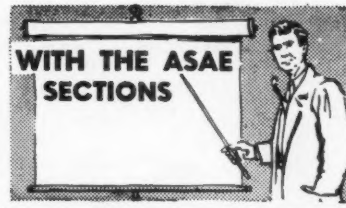
Robert E. Smylie
Governor of Idaho

Pacific Northwest Section

Over 200 attendants at the annual meeting of the Pacific Northwest Section, held October 18 to 21 at the Hotel Boise, Boise, Idaho, were privileged to hear governors from two states. Governor George D. Clyde of Utah told how the water problem can become a threat to future Americans as terrible and as real as the threat of nuclear warfare under which we now live. The Utah governor suggested several points that should be included in a national water policy. These included: Criteria should be set up under which all federal water development projects would be constructed; interstate contracts should be extended for even more cooperation between states; basin-wide planning, in full detail, and on the broadest possible base, should precede construction of all new development; pollution must be recognized as the greatest single threat facing an adequate water supply; an orderly, efficient and continuous program of studies, authorization and construction must begin immediately; and a more complete and accurate measurement and inventory of all national water resources, actual and potential, must be made without delay.

The group also heard Governor Robert E. Smylie of Idaho as he told them that the Soviet target date is 1980 for domination of the whole world including the United States, and that unless that time table is upset with the seizure by western powers

W. H. Knight, new chairman of the Pacific Northwest Section, receives the gavel from outgoing chairman, L. R. Swarner, following annual banquet



of the initiative in world affairs, 1980 is closer than we think. He noted that time had run out in Cuba while in Latin America the hour grows late, and that across Africa we are hard put to find a friend who will stand up and be counted on the side of freedom and the west. He declared that we cannot afford to let the friendly nations of South America fall under the domination of the communist world, and that if they do then the southern approaches to the North American continent are wide open and we will stand an island of liberty alone in a world enslaved.

ASAE President Byron T. Virtue, consultant, Bearings Division, The Torrington Co., presented an informative illustrated talk on the staff, facilities, and operation of the ASAE National Headquarters at St. Joseph, Mich. He also made several television and radio appearances and participated in planning sessions with section officers and representatives.

The four-day meeting technical sessions featured presentations covering all four phases of agricultural engineering, with a general session devoted to topics of broad professional interest. One session was devoted to the presentation of student papers. An afternoon tour of a local potato processing plant, purported to be the largest such plant in the world, and a post-meeting tour of Hell's Canyon were outstanding features of the meeting. One evening was devoted to the Section's annual banquet, while a second evening was utilized for technical sessions. Another special feature of the meeting was a joint dinner meeting of incoming and outgoing officers, the executive committee, major committee chairmen and division chairmen, along with national officers, Byron T. Virtue, ASAE president, and J. L. Butt, executive secretary of ASAE, for the purpose of discussing the Section program for the coming year.

Recognition was given to a delegation from the Saskatchewan Student Branch for driving a distance of 850 miles to attend the meeting.

The ladies, attending the meeting with their husbands, met at Hill House on Thursday, October 19, for breakfast and joined their husbands that evening for a banquet at Hotel Boise. On Friday they enjoyed a sightseeing tour through the Boise area, as

(Continued on page 634)

New Section officers pose with ASAE national officers, B. T. Virtue, president and J. L. Butt, executive secretary. Left to right are: J. L. Butt; W. H. Knight, chairman; B. T. Virtue; W. L. Griebeler, chairman-elect; and D. L. Jordin, secretary-treasurer

A morning brunch for ladies during Pacific Northwest Section meeting was well attended. Shown are: *(Seated, left to right)* Maxine Stewart, Marianne Holland, Dorothy Klein, Janet Anderson, Mardell Williams, Nila Stoick, Dorothy Swarner, Donna Larsen, Edith Cropsy, Leona Brandenburg, Elise McBirney, Elvie Johnson, Ruth Bondurant, Beulah Martin, Ruth Neff, and *(standing left to right)* Genevieve Pair, Marjory Coulthard, Pat Hagood, Nancy George, Nola Shearer, Mary Anderson, Adele Humpherys, Floss Fletcher, Alma Wilson, Hazel Walker, Benita Works, Ruth Maloney, and Marlys Morland

Charles M. Albright, product sales representative for hay and cotton harvesting machines at International Harvester Co., has been promoted to general supervisor. He has been associated with the company since 1933, when he started as a general salesman, and has been successively a zone manager, a service and sales supervisor, an assistant sales manager, and a product specialist.

Victor L. Stedronsky, investigations leader, Southwestern Cotton Ginning Research Laboratory, Agricultural Research Service, USDA, Mesilla Park, N. M., returned recently from Cairo, Egypt, and Rome, Italy, where he served as a consultant for the Food and Agriculture Organization of the United Nations and the Egyptian government. Mr. Stedronsky, a leading authority on roller ginning of extra long staple cotton, has been instrumental in helping the Egyptian government make use of a special UN fund for expanding its cotton research laboratories.

Elmer B. Hudspeth, Jr. has been made project leader of USDA's cotton mechanization program at the Texas Agricultural Experiment Station, Lubbock. He was formerly investigations leader, Southwestern Great Plains Field Station, Agricultural Research Service, USDA, Amarillo, Texas.

Irving J. Pflug, professor of food science, Michigan State University, has been granted a leave of absence to work on a special research project at the Continental Can Co. Research Center in Chicago, Ill.

Norman A. Evans, head of the agricultural engineering department at Colorado State University, has been elected a Fellow of the American Association for the Advancement of Science. He also is the ASAE alternate representative on the General Council of AAAS and will represent ASAE at a meeting in Denver late in December.

C. M. Albright

V. L. Stedronsky

E. B. Hudspeth, Jr.

I. J. Pflug

Dov B. Krimgold recently has returned to this country from overseas duty with the United Nations Technical Assistance Program in Israel. In 1957 he resigned from the Johns Hopkins University, where he served as principal research scientist (hydrology) to accept a two-year UN assignment in Israel. In 1960 he became United Nations special fund/FAO co-manager of a large watershed management pilot project, which he conceived, planned and directed during the first year of operation. He has now opened a consulting practice in conservation, drainage, irrigation, and related fields. He also plans to edit and translate Russian and German technical publications.

Donald R. Mackay has accepted a position with the Office of Weights and Measures of the National Bureau of Standards in Washington, D.C. Previously, he was an agricultural engineer with the Farm Electrification Research Laboratory, AERD, ARS, USDA, Beltsville, Md.

John R. Menear, who recently received an M.S. degree in agricultural engineering from Virginia Polytechnic Institute, has joined the Agricultural Engineering Research Division at USDA's Agricultural Research Center, Beltsville, Md.

O. F. Scholl, general supervisor, hay and cotton harvesting machine sales, International Harvester Co., recently has retired after 39 years of service with the company.

N. A. Evans

D. B. Krimgold

He is a native of Iowa, his birthplace being Elkhart. He attended Des Moines Catholic College and Drake University. His association with IH began in 1922, working in the service and sales departments until 1935. In 1936 he joined the general office staff where he was successively a special traveler and assistant product specialist on harvester thresher and power machinery sales from 1936 to 1938; product specialist on grass harvesting machine sales from 1938 to 1959; and general supervisor, hay and cotton harvesting machine sales from 1959 until retirement. He has been an ASAE member since 1952.

John M. Troeger has joined USDA's grain drying and storage project on the campus of Iowa State University. He recently received a B.S. degree in agricultural engineering from Ohio State University.

James L. Steele, who recently received a B.S. degree in agricultural engineering from Iowa State University, has joined the USDA's grain drying and storage project on the campus of Iowa State University.

Edsel A. Harrell has been named project leader of engineering research at the Southern Grain Insect Research Laboratory, Crop Production Engineering Research Branch, AERD, USDA, Tifton, Ga. He previously was an agricultural engineer with the USDA Cotton Ginning Research Laboratory at Stoneville, Miss.

Eddie C. Burt, who recently completed graduate study at the University of Georgia, is now at the U.S. Cotton Insect Research Laboratory, State College, Miss. He is working on engineering problems associated with the control of cotton insects.

William L. Stevenson has accepted the position of project engineer with Motec Industries, Inc., Hopkins, Minn. He was previously employed by J. I. Case Co. as a senior product engineer.

Jabez J. Bruwer has accepted the position of assistant director, National Division of Agricultural Mechanization and Engineering, Department of Agricultural Technical Services, Pretoria, Republic of South Africa. Previously, he was senior lecturer of agricultural engineering, University of

(Continued on page 636)

MOTEC INDUSTRIES ANNOUNCES PROMOTIONS

Several promotions involving ASAE members have been announced by Motec Industries Inc., Hopkins, Minn.

Douglas D. Dankel has been appointed to the position of chief agricultural equipment engineer. He started with the company in 1956 as an assistant project engineer on grain harvesting machinery. Since that time he has worked in the capacity of project engineer of all grain harvesting machinery and chief engineer of the harvesting division.

Robert B. Singer has assumed the duties of chief vehicle engineer. His association with the company began in 1959 when he accepted the position of manager of experimental department at the Engineering and Research Division. Prior to his new appointment he was chief engineer of the power trains department.

William S. Coleman has been made chief administrative engineer. He joined the company in May of this year. Previous to that time he was associated with the Research Laboratories of General Motors Corp. at Warren, Mich.

James N. Johnson has been appointed product engineer, construction machinery. He came to the company in 1960 as a project engineer and previously was an engineer with the John Deere Wagon Works, Moline, Ill.

Albert B. Hubbard has been appointed to the position of product engineer, soil preparation and seeding. He has been with the company since 1948, and has supervised production of farm machinery from initial design to finished product.

Jack D. Messner has been made product engineer of forage and cotton machinery. He started with the company in 1959 as an assistant project engineer. Prior to his new appointment he had been a project engineer.

Fred W. Kiser has assumed the duties of senior test engineer. He joined the company in 1960 as a test engineer.

Donald C. Staab has been appointed to the post of project engineer on hydraulics. He started with the company in 1960.

Sidney N. Setterlund has been made stress analyst. He became associated with the company in 1959 as design engineer on harvesting equipment.

. . . With ASAE Sections

(Continued from page 631)

well as a tour of the Simplot Co. at Caldwell. H. J. Swinney of the Idaho State Museum was the guest speaker when the ladies were dinner guests in the Darrell Larsen home on Friday evening.

The following slate of officers for 1961-62 were elected during the business meeting: W. H. Knight, chairman; W. L. Griebeler, chairman-elect; F. M. Roberts, first vice-chairman; E. B. Wilson, second vice-chairman; D. E. Booster, third vice-chairman; James Mays, fourth vice-chairman; and D. L. Jordin, secretary-treasurer.

Virginia Section

The annual meeting of the Virginia Section was held on October 20 and 21 at Virginia Polytechnic Institute, with 43 members and 18 visitors in attendance. The program included reports on an experimental tractor with hydrostatic drive by C. H. Meile, chief engineer of engineering research, International Harvester Co., and on tobacco harvesting and curing mechanization by C. W. Suggs, assistant professor of agricultural engineering, North Carolina State College. The need for environmental control in confinement hog production was emphasized in a discussion by R. E. Stewart, chairman, agricultural engineering department, Ohio State University. Also included were presentations giving almost complete coverage of VPI agricultural engineering research projects, with much of this information being presented on the project site. This afforded the group to ably view building structural test facilities, tillage experiments, and watershed instrumentation at first hand.

The following slate of officers for 1961-62 were elected during the business meeting: J. E. Collins, chairman; E. B. Hale and H. R. Roberts, vice-chairmen; and J. P. Walker, secretary-treasurer.

The Virginia Section elected officers for the year 1961-62 at its annual meeting held October 20 and 21 at the Virginia Polytechnic Institute. The new officers are from left to right: H. R. Roberts and E. B. Hale, vice-chairmen; J. P. Walker, secretary-treasurer; and J. E. Collins, chairman

Acadia Section

The first technical information meeting of the Acadia Section was held on October 13 in the Northeastland Hotel Ballroom, Presque Isle, Maine, with 23 members and 16 guests in attendance. The general theme of the meeting was "Needs and Trends in the Maine and New Brunswick Potato Industries." The first speaker on the program was A. L. Perry, professor of agricultural economics at the University of Maine, who viewed the theme from the standpoint of the economics of the Maine potato industry. He was followed by H. R. Scovil, assistant director of the extension branch, New Brunswick Department of Agriculture, who presented a similar topic concerning the economics of the New Brunswick potato industry. The final portion of the afternoon program was devoted to a panel discussion on the engineering needs of the potato industry. D. H. Huntington, assistant dean of agriculture, University of Maine, moderated the panel, which consisted of: Arnold Roberts, director, agricultural engineering branch, New Brunswick Department of Agriculture; B. L. Bondurant, head, agricultural engineering department, University of Maine; R. S. Claycomb, consulting engineer (agricultural), Grand Forks, N. D.; A. L. Perry, professor of agricultural economics, University of Maine; H. R. Scovil; and Paul Mosher, extension crops specialist, Maine Extension Service.

A dinner featured the evening program, during which R. S. Claycomb spoke on engineering problems in potato handling and storage. Another special feature of the meeting was a tour of Potato Service, Inc., a new Presque Isle potato processing plant.

Connecticut Valley Section

The following slate of officers for 1961-62 were elected by the Connecticut Valley Section at its October 18 meeting: Roger Olcott, chairman; J. J. Kolega, senior vice-chairman; E. S. Pira, junior vice-chairman; and R. G. Light, secretary-treasurer.

A 7:00 p.m. dinner meeting will be held on November 29 at the Svea Gille in Shrewsbury, Mass. The speaker of the evening will be Father Joseph Smith, physics department of Holy Cross College, and Civilian Defense radiological officer for Area 3 (central Massachusetts). The topic of his timely talk will be "Survival Under Nuclear Attack."

Georgia Section

October 19 and 20 were the dates of the fall meeting of the Georgia Section held at the University of Georgia Center for Continuing Education. The two-day meeting had as its theme "Space Age and Agricultural Engineering." The opening address on Thursday afternoon by O. C. Aderhold, president, University of Georgia, was entitled "Around the World in 80 Hours." His address was followed with presentations entitled "ASAE in Orbit," by J. R. Carreker, director of ASAE; "Mechanical Engineering in the Space Age," by T. A. Elliott; "Farm Machinery USA to the Moon," by H. K. Arp; and "Livestock Astrodomes," by R. G. Yeck. Even the football was in orbit when J. T. Griffith, head football coach, University of Georgia, addressed the group on the football in orbit during the Thursday evening banquet.

The Friday morning program included the following topics: Soil and Water Conservation in the Future, by E. C. Buie; Progressions in Poultry Processing, by K. N. May; Look Ahead with Electric Power, by A. L. Morris, Jr.; Opportunities and Problems in Agricultural Engineering Technology, by R. R. Harris; Rocketing the Co-Op Program, by O. W. Ginn; and Where Do We Go from Here? by R. H. Driftmier.

Minnesota Section

The Minnesota Section will hold a meeting at 7:30 p.m. on November 17 at the Richfield State Bank. The program will include the showing of a film entitled "The Green Giant's Magic," which will be followed by presentation of papers on new developments in adhesives, by G. W. Crain, advertising manager, adhesives division, Minnesota Mining and Manufacturing Co., and guide for selecting electric motors for agricultural applications, by A. M. Flikke and W. A. Junnila, associate professor of agricultural engineering, University of Minnesota and Farm Electrification Research Branch, USDA, respectively.

Oklahoma Section

The Oklahoma Section will hold its 11th annual fall meeting on November 17 on the campus of Oklahoma State University. The program will be built around the theme "Your Career in Agricultural Engineering—Professional Growth or Professional Obsolescence." The morning program will open with the showing of the ASAE film "Agricultural Engineering — the Profession with a Future." Also during the morning session, J. W. McTaggert, agricultural engineer, Portland Cement Association, will discuss "What's New in Concrete Structures," which will be followed by a panel discussion on the use of computers in agricultural engineering, by J. S. Matthews, hydrologist, USDA Soil Conservation Service, and J. G. Porterfield, professor of agricultural engineering, Oklahoma State University. A report on career guidance will conclude the morning program. During the noon luncheon, Lewis Strong, manager, Kay Electric Cooperative, will address the group. Student award presentations will also be made during the luncheon.

The afternoon program will include a discussion by E. W. Schroeder, head, agricultural engineering department, Oklahoma State University, on professional obsolescence, as well as one on agricultural engineering careers in underdeveloped areas, by D. A. Suter, agricultural missionary, Methodist Board of Missions, Northern Luzon, Philippines. The day-long program will be concluded with a business session.

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ASAE MEETINGS CALENDAR

November 17—MINNESOTA SECTION, Richfield State Bank.

November 17 — OKLAHOMA SECTION, Oklahoma State University, Stillwater.

November 17—QUAD CITY SECTION, American Legion Hall, Moline, Ill.

November 22 — WASHINGTON, D.C.-MARYLAND SECTION, USDA South Bldg., Washington, D.C.

November 24-25—MISSISSIPPI SECTION, Mississippi State University, State College, Miss.

November 27 — BATON ROUGE SECTION, Agricultural Engineering Auditorium, Louisiana State University, Baton Rouge, Louisiana.

December 12-15 — WINTER MEETING, Palmer House, Chicago, Ill.

April 19-20—PACIFIC COAST SECTION, Disneyland.

June 17-20 — ANNUAL MEETING, Mayflower Hotel, Washington, D. C.

NOTE: Information on the above meetings, including copies of programs, etc., will be sent on request to ASAE, St. Joseph, Mich.

...ASAE Members in the News

(Continued from page 632)

the Orange Free State, Bloemfontein, Republic of South Africa.

William H. Parady of Florida Ford Tractor Co. has received the honorary degree of State Farmer from the Florida Association of Future Farmers of America.

Max J. Lewallen has been made project leader of research on structures for storage of feed and forage under conditions of the southeastern United States for ARS, USDA, at Athens, Ga. He recently finished graduate work at the University of Georgia.

George E. Spencer, head, agricultural engineering department, Purdue University, is in Brazil for six weeks on the Purdue-Brazil Project.

Fred M. Crawford has been appointed farm electrification engineer for the sales department of Wisconsin Electric Power Co. and assigned the work direction of others in the general sales office, Farm Group. He previously held the position of assistant farm electrification engineer.

Pierre E. Maitin, formerly soil conservation engineer, SCS, Ministry of Agriculture, Israel, has accepted the position of irrigation research officer, Department of Native Agriculture, Umtali, Southern Rhodesia.

Arthur J. Muehling has been appointed an extension agricultural engineer with the USDA Federal Extension Service. He previously was assistant professor of agricultural engineering at the University of Illinois.

George H. Comer recently has completed requirements for an M.S. degree in agricultural engineering at Virginia Polytechnic Institute, and has accepted employment with the Soil and Water Research Division, ARS, USDA, at Danville, Vt.

Clyde Vidrine has been transferred from the Research and Engineering Center of International Harvester Co., Hinsdale, Ill., to its Memphis Works at Memphis, Tenn.

Ross S. Hamilton, formerly instructor of mechanics, School of Agriculture, Alberta (Canada) Department of Agriculture, has accepted the position of district irrigationist at the Colonization Branch, Alberta Department of Agriculture.

Donald N. Feather, merchandising coordinator, Tractor and Implement Division, Ford Motor Co., Birmingham, Mich., has been transferred to Utica, N. Y., as zone manager of the company's Utica sales district.

Irwin G. North has accepted a position as engineer for Continental Products and Sales, Gardena, Calif. Previously, he was affiliated with Collier Carbon and Chemical Corp. as agricultural engineer.

John S. Parker has been transferred by the Canada Department of Agriculture from Amherst, Nova Scotia, where he was director of the Maritime Marshland Rehabilitation Act, to Ottawa, Ontario, as director general of administration.

Harold C. Powers, formerly U.S. supervisor of field services for Massey-Ferguson Inc., has assumed the duties of western regional service manager for the company in Stockton, Calif.

Jesse M. Smith has accepted the position of field test engineer with the Rockford Works of J. I. Case Co., Rockford, Ill. His previous affiliation was with MFA Insurance Co. as a claims adjuster.

Jimmy R. Windham has joined Harris, Wood and Associates, consulting agricultural engineers, in the capacity of an engineer in the design and supervision of water control projects. He previously was an instructor in the agricultural engineering department of North Carolina State College.

Muhammad A. Baldo is now located in Guneid-Rufa'a, Sudan, where he is an inspector of agriculture, field mechanization, for the Ministry of Commerce, Republic of Sudan at the Guneid Sugar Factory. Formerly, he was an agricultural engineer in the land use and rural waters department, Ministry of Agriculture, at Khartoum, Sudan.

Pierre J. Jutras has returned to the University of Florida Citrus Experiment Station, after spending seven months as project engineer with the John Bean Division of Food Machinery and Chemical Corp. in Orlando, Fla. The position he now holds is that of assistant agricultural engineer and his work is in citrus production and harvesting machinery research.

John W. Propst, Jr., agricultural engineer and farm power contractor, is on a two-year tour in East Pakistan as agricultural representative for the U.S. State Department.

J. Lyle Shaver and **Hugh F. Grow** recently have been awarded research assistantships in agricultural engineering at Virginia Polytechnic Institute. During this past summer both men took part in a field study aimed at determining the performance characteristics of spreader trucks and have selected thesis problems in this field to be studied during the coming year.

Gerald W. Berryhill has accepted a position as design engineer with Starline, Inc. at Harvard, Ill. He formerly was a design engineer with J. I. Case Co. at Rockford, Illinois.

. . . The ASAE in Orbit

(Continued from page 601)

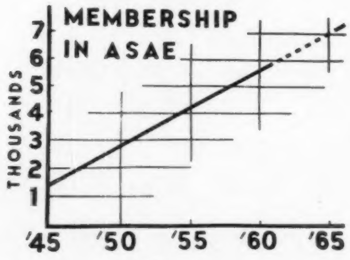

Fig. 1

weighed carefully and all angles of any question are considered thoroughly before a decision is reached. The guiding principle is a course of action that will best promote the profession, the Society, and the individual member.

This vehicle — ASAE — whose orbit we are considering today has two functional parts: the headquarters staff and the committees made up of many members.

The headquarters staff consists of five staff positions and the necessary complement of secretarial and clerical help. These staff positions include (1) the executive secretary, (2) the treasurer and assistant secretary, (3) the editor and publisher, (4) the public relations and advertising manager, and (5) the technical coordinator.

You are familiar with all these positions, except possibly the last one. The position of technical coordinator was authorized by the Board of Directors in June 1961. Page L. Bellinger, formerly of *Successful Farming,* has just this week been employed in this position. His major duty will be to work with the technical divisions and committees in handling matters of technical interest within the Society. This service has been needed for a long time. His help should mean much in the continued technical development of ASAE and agricultural engineering.

Much of the Society's work is accomplished through committee activities. There are 1,025 committee positions listed in the Society's 1961 Yearbook. How and to what extent have we in the Georgia Section been represented on these committees? These 1,025 positions for 6,000 members give an opportunity for one in six, or 17 percent of all members to be represented on some committee. We have 126 members in Georgia, and seven committee positions are filled by some of these 126. This is 5.6 percent of our members, which is only one-third as many as we should have. Clearly we in the Georgia Section are not taking advantage of our opportunities in this area. Committee activity is one of the best channels for service in ASAE. It is through this avenue that technical standards and recommendations are developed, programs are planned, and progress along many other lines is made. The new ASAE technical coordinator will help to expand this line of endeavor among our members.

Acceleration

The progress of ASAE has been tremendously accelerated during recent years. A few statistics will illustrate this fact:

1 Membership increased from about 1400 in 1945 to over 6000 in 1961 (Fig. 1).

2 The number of committees increased from 59 in 1950 to 100 in 1960, while the number of committee members grew from 411 to over 800 in that period (Fig. 2).

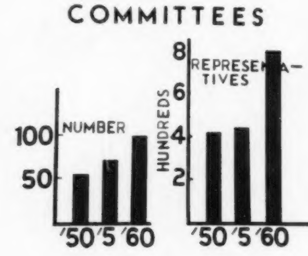

Fig. 2

3 An even more striking example of increased activity is ASAE membership in Engineering Joint Council (EJC). In 1957 the Society was an Associate Member of EJC with only one representative. After ASAE's election in 1961 as a "constituent society" in EJC, our responsibilities in this organization of the major engineering societies increased to 24 representatives on 17 committees (Fig. 3). Let me stress here the importance of this representation to our professional prestige and our standing among engineering organizations. It is no accident that agricultural engineering is becoming better known throughout the engineering profession. This is the result of determined professional effort, a record of achievement and responsibility meriting this advancement in EJC, and the fulfillment of dedicated efforts of ASAE members on EJC committees working in behalf of the entire engineering profession. All of us surely want to see ASAE progress still further in this direction.

ASAE truly became international in scope during the past year. It became a member of the Congress Inginerio Genie Rurale (CIGR), which has headquarters in Paris. A literal interpretation of this name is International Society of Agricultural Engineers. In this manner, our efforts are combined with those of similar societies of the world to further the profession and concepts of agricultural engineering for the betterment of mankind everywhere.

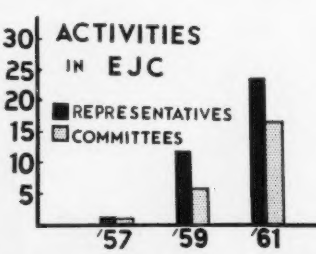

Fig. 3

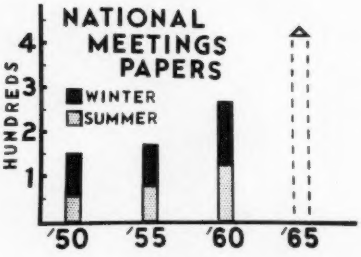

Fig. 4

Communications in Flight

The communications system of ASAE always has been one of its outstanding features. Major channels of communication are meetings, publications, and public relations.

Two national meetings each year plus numerous regional, state, and local section meetings, give every member an opportunity to present his own accomplishments and to obtain information on progress by his fellow members. There has been a phenomenal growth in recent years in the number of papers presented at the national meeting (Fig. 4). Add to this the papers in the sectional meetings and we see the magnitude of this opportunity for individual expression.

Publications likewise have shown a healthy rate of growth. Where there was *one* major publication in 1950, we now have *three.* Even so, the increase of technical papers has created a backlog of articles that need publishing. Steps have been taken to increase the number and the quality of papers published. Following are the steps required in getting a paper published:

- Present the paper on a meeting program
- Program chairman then presents the paper to the editor
- Review of paper by critical readers
- Return of paper to author with critical reader's comments
- Setting of type and page layout for publication
- Printer's proof
- Publication.

The current rate of about 200 papers published in a year, or four per week, requires that the editor have full cooperation of every member at each step of the way in this process toward publication.

Public relations is a valuable part of the Society's communications program. This term "public relations" means many things to many people. In ASAE it boils down to those steps taken to create a favorable impression on the part of the public toward our profession. Each member has a part in this effort, but to help toward this goal our

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. . . With ASAE Sections

(Continued from page 634)

Iowa Section

The Iowa Section held a 7:00 p.m. dinner meeting on November 10 at the McNeal Hi-Way Hotel in Des Moines. The program following the dinner included a talk on the interstate highway system in Iowa, by L. M. Clauson, chief engineer, Iowa Highway Commission, Ames, and a paper on counter-balance drives for mowers, by Tom Scaranato, product engineer, International Harvester Co., Hinsdale, Ill.

Pacific Coast Section Southern California Chapter

The Southern California Chapter of the Pacific Coast Section held a dinner meeting on November 11 at Mount San Antonio College, Walnut, Calif. Feature of the evening was a talk on "Urban and Rural Conflict — Fact or Fantasy," by J. M. Gillies, lecturer, School of Business Administration, University of California, Los Angeles.

Pacific Coast Section

The 40th annual meeting of the Pacific Coast Section will be held April 19 and 20 at Disneyland. Details will be carried in a future issue.

Pennsylvania Section

The Pennsylvania Section elected the following officers for 1961-62 at its fall meeting on October 20: R. S. Crist, chairman; E. A. Myers, vice-chairman; and P. M. Anderson, secretary-treasurer.

Washington, D.C.– Maryland Section

The Washington, D.C.-Maryland Section will hold a meeting on November 22 in the USDA South Building, Washington, D.C. T. E. Hienton, chief, farm electrification research branch, Agricultural Engineering Research Division, ARS, USDA, will speak at this luncheon meeting on farm electrification research in Europe. As he has just returned from a trip to several European countries where he observed a number of interesting activities—engineering and other — his talk will be illustrated with slides taken on the trip.

Alabama Section

The Val-Monte Motel, Guntersville, Ala., was headquarters for the Alabama Section meeting on October 19 and 20. Thursday morning was devoted to registration and early registrants were given an opportunity to view a Tennessee Valley Authority materials handling equipment display and to tour local plants. In the afternoon the group enjoyed a timely address by Frank M. Cameron from Redstone Arsenal. Following the address fishing, boating, and tours — including a cavern tour — were planned. On Thursday evening a cookout was held at a site overlooking Guntersville Lake. A technical session was held on Friday morning at which papers were presented on field engineering problems in connection with modernization of dairies, by Kyle Wilcutt; field to the table with pimentos, by E. A. Ward; and the results of temperature studies on broilers and laying hens, by Walter Grub. M. Kisu of the Farm Machinery Division, Kanto-Tosan Agricultural Experiment Station in Japan, also presented a paper on farm mechanization in Japan.

. . . Events Calendar

(Continued from page 629)

Society of America. Contact SSSA, 2702 Monroe St., Madison 5, Wis., for information.

February 18-24—*National Engineers' Week.* For details contact the National Society of Professional Engineers, 2029 K St., N.W., Washington 6, D.C.

February 27-28 — *Tenth Annual National Dairy Engineering Conference,* Michigan State University, East Lansing. Contact Carl W. Hall, Chairman, National Dairy Engineering Conference, Agricultural Engineering Dept., Michigan State University, East Lansing.

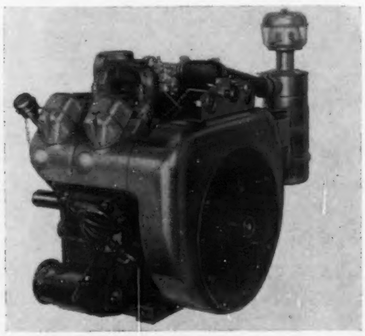
March 6-11 — *33rd International Machinery Show,* Paris, France. For additional details write to Robert de Wilde, Agricultural Attache, 1001 Connecticut Ave., N.W., Washington 6, D. C.

May 16-17 — *Second Technical Conference on Irrigation, Drainage, and Flood Control,* Omaha, Nebr. Information may be obtained by writing to United States National Committee, International Commission on Irrigation and Drainage, 300 Insurance Bldg., Denver 2, Colo.

June 4-6 — *Nuclear Congress and Atomic Exposition,* New York Coliseum, New York, N. Y. Sponsored by Engineers Joint Council, Inc. Details may be obtained from NCAE, 117 S. 17th St., Philadelphia 3, Pa.

New 60-HP Air-Cooled Engine

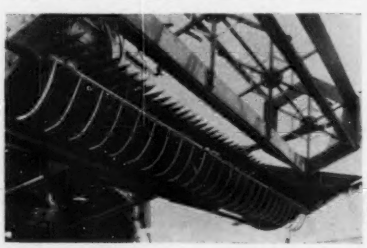
Wisconsin Motor Corp., Milwaukee 46, Wis., has introduced a new valve-in-head, air-cooled, V-4, 60-hp engine designed for



heavy-duty applications in the agricultural, construction, and industrial fields. Designated as the Model V-460D, the new engine is power rated from 36 hp at 1400 rpm to 60.5 hp at 3000 rpm, and develops 1650 in. lb torque at 1600 rpm. It has a displacement of 154 cu in., features 7.1:1 compression ratio, and weighs 521 lb dry. The company reports that size and compactness were stressed in its design.

Automatic Header Control

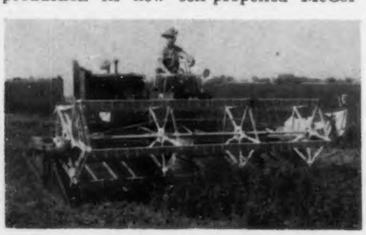
M & W Gear Co., Anchor, Ill., has announced a new header control for combines to provide automatic control of cutterbar



height—even as close as 1 in. above ground. In operation a hydraulic "feeler" bar, consisting of fingers spaced 6 in. apart and mounted under and back of sickle, signals master control to raise or lower height of cut. A built-in safety lock-valve holds header position if hydraulic pressure is suddenly cut off.

New SP Windrower

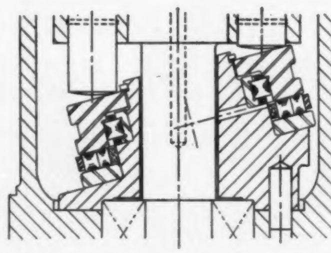
International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill., has released for production its new self-propelled McCor-



mick No. 201 windrower, which attaches a hay conditioner to cut, condition, and windrow in one operation. Designed especially for heavy hay crops as well as for grain, the new windrower cuts 10, 12, 14, and 16-ft swaths. Power is supplied by a 42-hp IH engine. The reel can be raised hydraulically from 1¾ to 19 in. above the cutterbar. Knife speed is 640 rpm. This allows a clean cutting job at a fast ground speed. The platform can be raised and lowered hydraulically by a foot pedal from ground level to 32¼ in. above ground. The unit has seven forward speeds, from 2½ to 9 mph and can be pulled up to 30 mph without removing or disengaging final drive chains.

Radial-Thrust Bearing

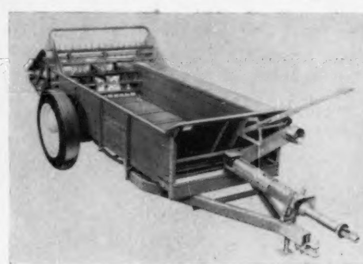
Rollway Bearing Co., 541 Seymour St., Syracuse, N. Y., has developed a combination radial and thrust bearing for a hydraulic wobble pump. The bearing is designed for operation at pressures up to 2000 psi and 2500 rpm under a load imposed by a wobble action and transmitted to pistons which ride against the back side of the bear-



ing race. The thrust plate OD is 4.953 in., and ID is 3.25 in. The combination radial outer race and thrust plate that actuates the pistons has an OD of 4⅞ in. and a 2½-in. bore. The inner radial race has an ID of 2.437 in. to fit the drive mechanism. According to the manufacturer, the bearing has a useful thrust capacity of 3,350 lb at 1,200 rpm and a radial capacity of 2,370 lb at 1200 rpm.

PTO-Driven Spreader

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., has introduced its new 140-bu PTO-driven Model 140 manure spreader,



offering five rates of feed for a wide choice of per acre applications. Company engineers have selected positions for the upper beater in respect to the lower to allow what they consider optimum clearance for smooth, even feeding and balanced unloading. Emphasis has been placed in locating beaters so that they might run at the right speed and provide center delivery to widespread paddles for uniform spreading and low build-up of material on the paddle shaft. The 14 paddles have been specially designed to give both slicing and spreading action.

Adds to Wheel Equipment Line

Motor Wheel Corp., Lansing, Mich., has announced the addition of double-beveled rims and rim-and-clamp assemblies to its line of wheel equipment for farm machinery. The two new products are for use on adjustable wheels. Double-beveled rims may be used with loose clamps, while clamp assemblies welded or riveted to standard rims are used for the new rim-and-clamp assemblies.

New Friction Material

Johns-Manville Corp., 22 E. 40th St., New York 16, N. Y., has introduced new organic friction material, developed to combat fading under high temperature conditions. With the new material, called J-M Style 160, the company states that control of brakes and clutches is now possible

at temperatures up to 1000 F, under conditions of high loads and fast cycling. The new material reportedly exhibits an average coefficient of friction of 0.56 at 350 F, 0.62 at 600 F, and 0.53 at 1000 F. It is a rigid, molded product (tan in color) and contains zinc particles. It is manufactured in blocks, facings, and sheets.

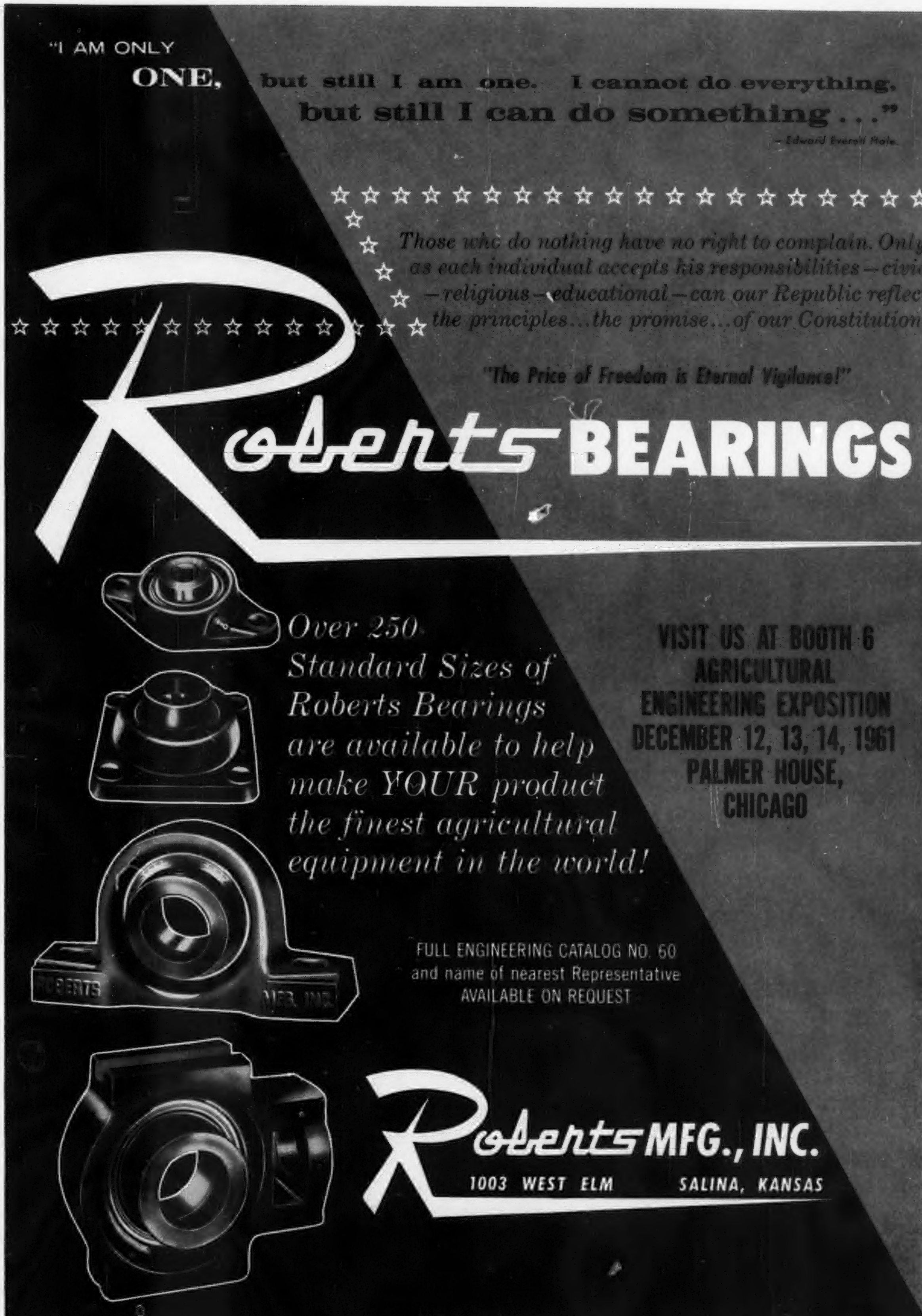
Radiation Dosimeter Reader

G. K. Turner Associates, 2524 Pulgas Ave., Palo Alto, Calif., has developed new accessory equipment for rapid conversion of a fluorometer to the function of reading ionizing radiation dose, utilizing the new line of silver-activated glass dosimeter forms. Reading time of dose is reported at less than 1 min. Range of the radiation dosimeter reader using glass rods is 10 to 100,000 roentgens from Cobalt 60 radiation. Glass dosimeter plates provide a range of 2 to 30,000 roentgens from Cobalt 60 radiation.

New 4-Wheel Drive and Steer Tractor

M-R-S Manufacturing Co., P.O. Box 199, Flora, Miss., announces the availability of a new line of heavy duty 4-wheel drive, 4-

wheel steer agricultural tractors. The present line consists of two models — the 91.5-dhp A-90 and the 120.6-dhp A-100. Both models are equipped with 10-speed constant-mesh transmissions which provide seven working speeds up to 10 mph. Other mechanical features include 4-cycle diesel engines, spiral bevel gear and pinions and planetary final drives. An independently controlled hydraulic steering system allows the operator to steer front and rear wheels independently. Approximate operating weights are 20,600 lb for the A-90 and 25,500 lb for the A-100.



Visit our Booth 6 at Agricultural Engineering Exposition.

The following bulletins have been released recently. Copies may be obtained by writing to author or institution listed with each.

The two following reports are available from the Information Division, Canada Department of Agriculture, Ottawa, Ontario, Canada:

Progress Report, 1955 - 1959 — Experimental Farm, Morden, Manitoba. 1961.

Research Report, 1959 - 1960 — Research Station, Winnipeg, Manitoba. 1961.

Canada Department of Agriculture Annual Report for the Year Ended March 31, 1961. Queen's Printer. Ottawa, Canada. Price, 50 cents.

1960 Annual Report of the International Institute for Land Reclamation and Improvement. IILRI, Wageningen, Holland.

Single-Phase Electric Motors for Farm Use, by H. B. Puckett. Farmers' Bulletin No. 2177. September 1961. Price, 15 cents. Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C.

Guide and Data for Engineers and Purchasing Agents. Booklet. Reinforced Plastics Div., The Society of the Plastics Industry, Inc., 250 Park Ave., New York 17, N. Y.

Combine Harvesting, by Nils Buremalm and Ewert Aberg. Bulletin No. 270. 1961. Swedish Institute of Agricultural Engineering, Ultuna, Uppsala 7, Sweden.

A Bibliography of Farm Buildings Research—1945-1958—Part VI, Buildings for the Processing and Storage of Fodder. Price, 4s. 6d. Agricultural Research Council, Cunard Bldg., 15 Regent St., London, SW1, England.

Sprinkler Irrigation (Fundamentals), by S. Elhanani. June 1961. Ministry of Agriculture, Irrigation Extension Service, P.O. Box 7073, Hakirya, Tel Aviv, Israel.

Report on Test of Massey-Ferguson Model MF-765 Mark II Diesel Tractor (with 4.A.203D engine). No. 284/BS March-April 1961. National Institute of Agricultural Engineering, Wrest Park, Silsoe, Bedfordshire, England.

Research Report, 1959-1960 — Research Station, Vancouver, B.C. Information Division, Canada Department of Agriculture, Ottawa, Ontario, Canada.

Ginning Research to Maintain Quality, by W. M. Hurst. Reprint from the September 2, 1961, issue of *The Cotton Gin and Oil Mill Press.* W. M. Hurst, 13 Devon Rd., Silver Spring, Md.

New Tree Shaker, by P. A. Adrian and R. B. Fridley. Article in August 1961 issue of *California Agriculture.* California Agriculture, 207 University Hall, 2200 University Ave., Berkeley 4, Calif.

Home Heating with Electricity, by H. H. Beaty. Booklet. Office of Information, Mumford Hall, University of Illinois, Urbana.

Pole Frame Construction for Idaho Farm Buildings, by J. E. Dixon and J. W. Martin. Bulletin 362, July 1961. Agricultural Extension Service, University of Idaho, Moscow.

Employer's Inventory of Critical Manpower. 14 pages. Price, $1.00. Engineering Manpower Commission of the Engineers Joint Council, 345 E. 47th St., New York 17, N. Y.

MANUFACTURERS' LITERATURE

Literature listed below may be obtained by writing the manufacturer.

Industrial Lubricants

The Pure Oil Co., 200 E. Gold Rd., Palatine, Ill. — A 16-page, 2-color brochure outlines complete line of industrial lubricants; also gives the characteristics and purposes of the company's more than 60 different kinds of industrial lubricants. These are detailed under puroturbine oils, engine oils, cylinder and heavy mineral oils, textile oils, gear lubricants, miscellaneous oils, and industrial greases.

Safety Guide for Tank Entry

Manufacturing Chemists' Association, 1825 Connecticut Ave., N.W., Washington 9, D.C. — An 8-page pamphlet (No. SG-10) gives recommended safe practices and procedures for entering tanks and other enclosed spaces. Also included are three basic principles to follow in avoiding or overcoming the hazards in tank entry.

Truck Refrigeration Unit

Master-Bilt Refrigeration Mfg. Co., 4209 Folsom Ave., St. Louis 10, Mo. — A one-page circular describes and illustrates the Master-Bilt model HTR 50 engine-generator powered refrigeration unit for truck cooling. Under "construction and operation" are included descriptions of the engine, cooling unit, generator, and operation.

Sensing Devices

Designers for Industry, Inc., 4241 Fulton Parkway, Cleveland 9, Ohio — A 4-page progress report on sensors includes case histories on how sensing devices are used to (1) validate currency, (2) measure strip steel and feed data to a logger, (3) provide beta ray measuring equipment easily read by operators on high-speed production lines, and (4) measure sheet rubber thickness with a non-contacting device to 0.0001 in. accuracy.

Electric Infrared Heat

Fostoria Corp., Department 106, 1200 N. Main St., Fostoria, Ohio — A 4-page, 2-color bulletin, entitled "Electric Infrared Radiant Heat for Farm or Ranch," describes and illustrates the uses of infrared radiant heat on the farm. Also included are three testimonials.

Automatic Clutch

Olme Precision, Inc., 399 Masonic Bldg., Portsmouth, Ohio — A 4-page engineering and application data folder on Power-Max automatic, adjustable centrifugal clutches gives application classes and ratings plus specifications and dimensions for direct drive, V-belt and flat belt type units.

Laboratory Instruments

Central Scientific Co., a division of Cenco Instruments Corp., 1700 W. Irving Park Road, Chicago 13, Ill. — Catalog No. J-300, containing 1008 illustrated pages, shows complete line of company's instruments and equipment for research, educational, and industrial laboratories. It is divided into the following sections: Balances; general laboratory apparatus and glassware; gas and air pollution analysis; pH measurement; industrial testing; spectrophotometry and colorimetry; refinery supply specialties; bacteriological and clinical; school sciences; agriculture; microscopes and projectors; physical chemistry; chromatography; physics and electronics; high vacuum equipment; and constant temperature devices.

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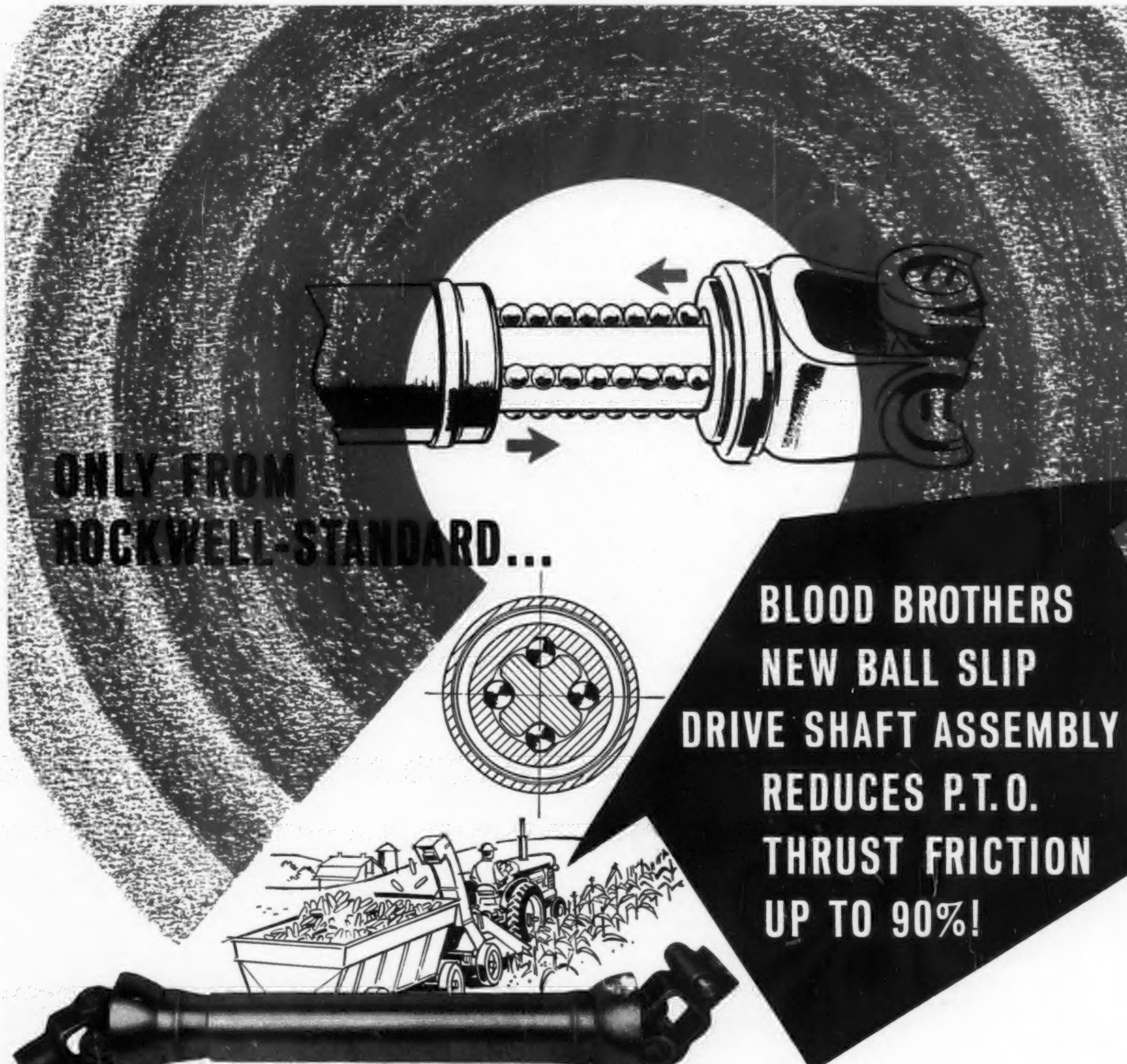


Farm equipment today is bigger, bulkier, heavier than ever. As a result, tractor P.T.O. drive shaft assemblies are subjected to hours of rugged use and abuse. When it comes to wear like this, spline shaft drives just can't take it! Edges become burred, rough, worn. Shafts get "locked" in place. P.T.O. bearings often break.

NEW BALL SLIP ASSEMBLY REDUCES P.T.O. THRUST FRICTION UP TO 90%!

Rockwell-Standard engineers have successfully solved the problem with an exclusive new Ball Slip Assembly that *reduces P.T.O. thrust friction up to 90% compared with spline type shafts for longer wear, more dependable service.* Several series of metal balls are held in grooves between the inner and outer shafts. This minimizes total metal-to-metal contact, keeps shafts "sliding smooth" for easy movement, improved wear-ability, trouble-free operation.

The unique Blood Brothers Ball Slip Assembly is proving itself in daily use. Many of the nation's leading farm equipment manufacturers have specified it for their units. It is typical of the new product developments that come from the continuing research of Rockwell-Standard engineers. Their designing skill and production experience have brought greater efficiency and economy to every major field of industry. Let them prove what they can do for you!

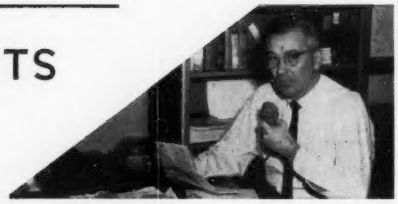
See us at the
1961 Agricultural Engineering Exposition
At the Palmer House in Chicago
Dec. 12-15 — Booths 90-91

ROCKWELL-STANDARD
CORPORATION
ROCKWELL R STANDARD
Universal Joint Division, Allegan, Michigan

Visit our Booths 90, 91 at Agricultural Engineering Exposition.

CHECK POINTS

by J. L. BUTT



HALF A MILLION A MONTH

CONGRATULATIONS, agricultural engineers! You have established a "Half a Million a Month" Club! This is the "viewing rate" of persons seeing our career motion picture, "Agricultural Engineering—The Profession with a Future,"* during its first full year of availability. The estimate is based on reports submitted by representatives from 35 of the states and provinces.

Here's how we calculated the rate. Thirty-five states reported 1,272 individual showings of the film to a total audience of 58,936. We presume copies of the five-step plan leaflet also were distributed to a majority of this audience — giving additional exposure to the profession of agricultural engineering. Twenty of these states also reported 56 TV showings to an estimated audience (based on average figures the TV people normally use) of 2,800,000. Some other reporting states could not supply accurate counts of number of television showings, and a few indicated the film had not been shown at all. We believe it is conservative to estimate that there were at least 20 TV showings in the other 30 states (we know of at least two showings in one state which reported only a "?") — giving an additional audience of 1,000,000.

In addition, the USDA Motion Picture Service reported 57 TV bookings through the Washington office through December 1960, and another 21 through June 1961—total 78, and an audience of 3,900,000. They also reported a total audience of 7,451 through other showings including two runs in the Patio Theater in Washington.

Your picture is being shown in Egypt (two prints), South Rhodesia, Australia, Tunisia, Ceylon, Chile, France, Germany, and other parts of the world by representatives of FAO, the Rockefeller Foundation, interested industries, and ASAE representatives. Prints have been loaned from ASAE headquarters for showings before industry groups and for special purposes. The Los Angeles City Board of Education has purchased four prints for career showings within the Los Angeles school system. It was shown at the Chicago International Trade Fair over a two-week period and won the first-place medal in the "Guidance — Personal and Vocational" category at the Third American Film Festival (with subsequent showings across the nation). We do not have attendance records on all these showings, but surely the total must exceed 5,000.

The total of all these figures exceeds 7,700,000; hence our "rounded-off" claim of "Half a Million a Month" over the first reporting period.

*For those not familiar with the film, please refer to page 662, October 1960 issue of Journal — and other frequent reports on table of contents page during past two years.

With the numerical gymnastics out of the way, we should stress, however, that agricultural engineers in some areas still have barely begun to make use of the picture. The movie is excellent, not only for providing factual career information, but also as a public relations tool to acquaint adult groups with the meaning of agricultural engineering. It can help to create job opportunities, explain the work and capabilities of agricultural engineers, and create a better public understanding and appreciation of the role of agricultural engineering in our society.

Can we increase our efforts during the coming year, particularly in those areas where the film has been used only sparingly, and make it a "Million a Month Club"? Will you, as a member, resolve to see that the movie is shown to civic, school, club, and other groups in your community? From personal experience we can predict that you will be gratified with the response — even among groups quite remote from farming or agriculture. But *all* such groups must be included in the "public" that a good public relations effort must reach. We must not just "talk to ourselves" and our "immediate families."

Finally, we must all recognize that a successful information program must be carried out, with modifications, over a *period of time.* One successful manager in the field of product publicity claims that 32 repetitions of an impression are necessary to assure recognition and remembrance. Undoubtedly, this varies with the effectiveness of each impression — but one conclusion may be drawn: *No one-shot effort can be expected to make a major impact on public opinion.* Our motion picture and related public relations efforts must extend over a period of years to produce significant results.

So we summarize by saying "well done" to those who have established our excellent record to date. And to all others we say "will you accept the responsibility of seeing that the 'public' around you learns more about your profession?" As agricultural engineers this is *our* job and responsibility — no one else will do it for us — nor should they!

(Prints of our film are available in all states. We recommend that requests for use of a print be directed to agricultural engineering departments in home states. If local prints are all scheduled, a few are available for loan from ASAE.)

. . . The ASAE in Orbit

(Continued from page 638)

Society mails what it designates as the "Bulletin" each month to a selected list of about 1500 industry and advertising agency executives. News releases and other information are sent to publications, broadcasting stations and other media telling the story of agricultural engineering. This phase of our program needs a faster rate of growth.

Financing the Flight

Financial support is a necessary part of this orbiting ASAE. Our budget totals close to $200,000 each year. The two main sources of revenue are from advertising space in our publications and dues of individual members.

Advertising is the backbone of the financial support of our publications. There is a high degree of correlation between the total number of pages in AGRICULTURAL ENGINEERING and the number of pages of advertising (Fig. 5). The members can render a real service to our Society by letting our advertisers know that we see and are benefitted by their advertising messages in AGRICULTURAL ENGINEERING and AGRICULTURAL ENGINEERS YEARBOOK. These messages are especially directed to our highly selective and influence-laden audience of engineers in agriculture. We must, each one of us, help build this foundation support of advertising which makes it possible for our publications to soar to greater heights. Special effort is constantly being directed toward increasing this part of our income to more nearly meet the growing demand for expanded publications.

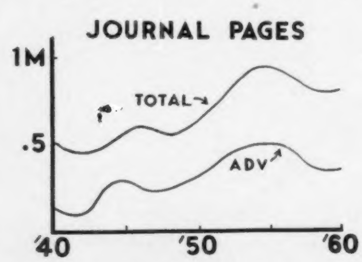


Fig. 5

The recently announced increase in membership dues will enable the Society to improve and expand its services in other aspects of its activities. When it is realized that membership dues have remained at nearly the same level since 1920, regardless of rapidly rising costs of everything, we wonder how the Society has progressed on its past income to the point of eminence we now so proudly enjoy.

Orbit Achieved

Yes, ASAE is really in orbit. We have a large and rapidly increasing membership of outstanding dedicated scientists and engineers. Our place among the engineering societies of this nation and the world is solid and increasingly recognized. Our organization's finances are sound and our leadership is superb.

We have a bright future if we continue to respond to the engineering challenges agriculture will have to offer in the years ahead. We can be sure the agriculture of tomorrow will require more and more engineering. We agricultural engineers, through our own individual initiative and collectively through ASAE, must guide and direct this future progress. Just how far we go is a decision that rests with you, the members of ASAE.

PERSONNEL SERVICE BULLETIN

Note: In this bulletin the following listings current and previously reported are not repeated in detail. For further information, see the issue of AGRICULTURAL ENGINEERING indicated. "Agricultural Engineer" as used in these listings is not intended to imply any specific level of proficiency or registration as a professional engineer. Items published herein are summaries of mimeographed listings carried in the Personnel Service, copies of which will be furnished on request. To be listed in this bulletin, request form for Personnel Service listing.

Positions Open — May — O-198-121, 199-122, 218-124, 226-125. **June**—O-257-126, 257-127, 265-128, 259-129. **July** — O-284-130, 286-131, 293-132, 294-133, 294-134. **August** — O-310-136, 329-137, 334-138, 341-140. **September** — O-350-141, 311-142. **October** — O-395-144, 405-145, 408-146, 408-147, 421-148, 424-149.

Positions Wanted — **May** — W-190-30, 97-31, 200-32, 201-33, 202-34, 203-35, 204-36. **June** — W-244-37, 264-39. **July** — W-228-41, 213-42, 285-44, 280-45, 290-46, 219-47, 296-50. **August**—W-181-51, 306-52, 307-53, 305-55, 304-56, 323-57, 317-58, 318-59, 330-60, 333-61, 302-62. **September** — W-352-63, 351-65, 370-66. **October** — W-372-67, 414-68, 336-69, 427-70, 430-71.

NEW POSITIONS OPEN

Agricultural Engineer (graduate assistant) for cotton mechanization research with emphasis on weed control and defoliation. Some related work on allied crops. Southern state university. Some field work. BSAE. Farm background preferred. Willing to work and able to get along with associates. MS to be completed in two school years. Opening effective Feb. 1, 1962. Salary $3000 for 12-mo. period. O-453-151.

Agricultural Engineer for design and development on present and new products with manufacturer of small tractor and attachments. Southeast. Prefer graduate engineer with some actual mechanical design experience. Excellent opportunity in growing division of an expanding company. Salary open. O-443-152.

Agricultural Engineer for research on structures, facilities and methods for storing and handling white potatoes, with federal agency. North Central location. Age 25-40. BSAE with about 5 yr. experience, or MSAE with less experience. Farm background and research experience in structures and structural facilities, materials handling, crop drying, or air conditioning and refrigeration. Able to plan and carry on research in cooperation with other research branches, and to work harmoniously with a small group of professional workers. Opportunity to advance to head of branch at research center. Salary $7560. O-462-153.

Agricultural Engineer to be in charge of Power and Machinery Section (teaching and research) with North Central Agricultural Engineering Department, Land Grant College. PhD in Agricultural Engineering desired with MS and additional work and experience to be considered. Teaching and research experience in Power and Machinery necessary. Large undergraduate enrollment and graduate program in Power and Machinery at present time. The finest facilities and equipment for all phases of work. Salary and rank open. Open December 1961. O-469-154.

Agricultural Engineer in Power and Machinery Section (teaching and research) with North Central Agricultural Engineering Department, Land Grant College. PhD in Agricultural Engineering desired or MS and additional work, experience, and/or industrial experience desired. Excellent facilities. Salary and rank open. Open immediately. O-469-155.

Agricultural or Civil Engineers (3) for field and office work in soil and water conservation, including erosion control structures, detention dams, ponds, drainage, etc., with federal agency. North Central location. Age 22-40. BSAE or BSCE. No experience required. Must be physically able to perform field work, and enjoy working with farmers. Excellent opportunity for advancement. Salary $5335 to $6345, depending on scholastic rating and/or qualifying experience. O-470-156.

Agricultural Engineer for sales engineering in the field of farm electrification. Midwest electric utility. Challenging professional position with opportunity for growth and development. Salaried. O-498-157

NEW POSITIONS WANTED

Agricultural Engineer for teaching and research in soil and water, irrigation, drainage, hydraulics, or fluid mechanics, with college, preferably in South or Southwest. Registered professional engineer. Prefer 9-month term teaching, with summers free for consulting work. Married. Age 43. Allergy to smog. BSAE 1946, Oklahoma State University. MSAE, 1947, Texas A & M College. Work toward PhD in irrigation engineering 1½ yr., Utah State University. Teaching and research experience 1½ yr. Extension and consulting, 5 yr. War commissioned service in Navy as photographic and engineering officer. Available Feb. 1962. Salary, $9000. W-436-72.

Agricultural Engineer for design, development or research in power and machinery or soil and water, with manufacturer or farming operation. Western location preferred, others considered. Willing to travel. Single. Age 24. BSA and MSAE. Experience 2 yr. in undergraduate teaching, University of the Philippines; 2 yr. part time research, agricultural engineering department, Auburn University. Available on reasonable notice. Salary open. W-441-73.

Agricultural Engineer for extension, teaching, research, writing, or management in power and machinery or rural electric field, with industry or public service, anywhere in USA. Married. Age 36. Corrected vision. BSAE 1951, University of Nebraska. Experience as power use advisor with electric utility, 6 yr. Supervision of maintenance and repair, including development of procedures and training of mechanics with farm product processor, 3 yr. Noncommissioned military service over 1 yr. Available on reasonable notice. Salary $9250-9500. W-449-74.

The following is a list of recent applicants for membership in the American Society of Agricultural Engineers. Members of the Society are urged to send information relative to applicants for consideration of the Council prior to election.

Bechtel, Stanley C. — Asst. to vice-pres., marketing, Rilco Engineered Wood Products Div., Weyerhaeuser Co., Tacoma, Wash.

Benson, Robert T. — Instr., agr. eng. dept., Virginia Polytechnic Institute, Seitz Hall, Blacksburg, Va.

Breshears, Marion M. — Shop supervisor, Green Giant Co. (Mail) 728 S. Fifth St., Dayton, Wash.

Chen, Cheng-lung — Graduate res. asst., agr. eng. dept., Michigan State University, East Lansing, Mich.

Coutts, Robert R. — Head, diesel dept., The Southern Alberta Institute of Technology, Calgary, Alta., Canada

Cox, Robert B. — Asst. engr., Vagabond Coach Mfg. Co. (Mail) 802 W. Coon Lake Rd., Howell, Mich.

Dawrs, Harvey P. — Chief engr., pineapple div., Libby-McNeil & Libby, Box 1140, Honolulu 7, Hawaii

Depew, Frank S. — Mgr., structures and eng. div., Doane Agricultural Service Inc. (Mail) 8730 Glenwood Dr., Crestwood 26, Mo.

Dickinson, Charles L. — Dir. of res. and economics, Farm Equipment Institute, 608 S. Dearborn St., Chicago 5, Ill.

Duran, Jose E. — Dir. of special projs., Ministry of Agriculture and Livestock. (Mail) 27 Calle Poniente 1032-A, San Salvador, El Salvador

Ellis, Robert W. — Chief engr., agr. tire eng., Goodyear Tire and Rubber Co., 1144 E. Market St., Akron 16, Ohio

Farmer, Bobby K. — Territory mgr., James Mfg. Co. (Mail) R.R. 1, Box 31C, Pulaski, Va.

Hayes, William F. — Chief, Physical Test Laboratory, Massey-Ferguson Inc., R.P.A. Box 322, Detroit 32, Mich.

Hosokawa, Akira — Asst. prof., Rakuno College, Nishi-Nopporo, Ebetsu, Hokkaido, Japan

Kumar, Surendera — Res. asst. (eng.), Central Soil Conservation Board, Ministry of Food and Agriculture, Soil Conservation Res. Centre, P.O. Jogbani, Bihar, India

Larson, Lloyd S. — Exec. secy., Midwest Feed Manufacturers Association, and pres., Feed Production School, Inc., 20 W. Ninth Street Bldg., Kansas City 5, Mo.

Maldonado-Sierra, Cesar — Rural elecn. spec., agr. ext. service, University of Puerto Rico, Box 607 Rio Piedras, Puerto Rico

Matthews, Richard M. — State conserv. engr., (SCS) USDA. (Mail) 764 E. Magnolia Ave., Auburn, Ala.

McElmurray, Edward W. III — Salesman, F. E. Myers & Bro. Co., Ashland, Ohio

Mejia, Arturo — Irrigation and drainage engr., Servicio Tecnico Agricola Colombiano Americano. (Mail) Carrera 6 #6-25, Bocagrande, Cartagena, Colombia, S. A.

Metzger, Jack L. — Sales dev. analyst, sales dev. dept., Gar Wood Industries, Inc., Wayne, Mich.

Naik, Vorkady A. P. — Graduate student, S. Vodrazkova, Polytechna, P.O. Box 423, Prague 1, Czechoslovakia

Nunnery, Thomas W. — Dist. serv. supervisor, International Harvester Co. (Mail) 5421 Glenham Dr., Charlotte 9, N.C.

Palmerton, Gene S. — Proj. engr., Stubenberg Co., Ltd., Campbell Industrial Park, P.O. Box 1096, Waipahu, Oahu, Hawaii

Perkins, Bernard C. — Gen. mgr., Perkins Manufacturing Enterprises Inc., P.O. Box 1361, Winter Haven, Fla.

Potter, Jimmie C. — Engr., John Deere Res. and Eng. Center. (Mail) 2210 Rainbow Dr., Cedar Falls, Iowa

Quintana, Sebastian V., Jr. — Jr. agr. engr., FOD, Bureau of Plant Industry, San Andres, Malate, Manila, Philippines

Samples, Lawton E. — Agr. engr., (SCS) USDA. (Mail) P.O. Box 343, Tifton, Ga.

Taylor, Howard M. — Res. soil scientist (physics), Southwestern Great Plains Field Station, (SWCRD, ARS) USDA, Bushland, Texas

Wigington, James T. — Civil engr., Ozark National Forest, U.S. Forest Service, Russellville, Ark.

Willis, Albert H. — Prof. of mechanical eng., University of New South Wales. (Mail) 10 Oakland Ave., Beecroft, N. S. W., Australia

TRANSFER OF MEMBERSHIP

Burgener, Maurice L. — Mgr., Farm Bureau, Portland Cement Assn., 33 W. Grand Ave,. Chicago, Ill. (Associate Member to Member)

Jewell, Donald E. — Field test engr., supervisor, J. I. Case Co. (Mail) 2811 Summerdale Ave., Rockford, Ill. (Associate Member to Member)

Maher, Thomas F. — Prof. of agr. eng., University of Southwestern Louisiana. (Mail) Box 487, USL Station, Lafayette, La. (Associate Member to Member)

Pallmeyer, William C. — Co. agr. agent, Motley County, Box 338, Matador, Texas (Associate Member to Member)

STUDENT MEMBER TRANSFERS

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Bumpious, Doyle A. — (University of Tennessee) International Harvester Co., P.O. Box 268, Memphis, Tenn.

Gasaway, Gary A. — (Oregon State College) 921 West Highland Ave., Hermiston, Ore.

Haynes, Larry E. — (Louisiana Polytechnic Institute) (SCS) USDA, New Madrid, Mo.

Horner, Norval A. — (University of Saskatchewan) Box 36 — Blaine Lake, Saskatchewan, Canada

Key, Bill L. — (Texas Technological College) Murray Co. of Texas, 3200 Canton, Dallas, Tex.

Longhouse, Howard A. — Agr. eng. dept., Cornell Univ., Ithaca, N. Y.

McClure, Walter R. — (Ohio State University) 15103 Lesure Ave., Detroit 27, Mich.

Neill, Joseph R. — (University of Tennessee) Box 114, R.R. 1, Mohawk, Tenn.

Poplis, John A. — (Ohio State University) (SCS) USDA, 128 Grandview Ave., Wadsworth, Ohio

. . . Manufacturers' Literature

(Continued from page 644)

Precision Expanding Mandrels

Erickson Tool Co., 34350 Solon Road, Solon, Ohio — An 8-page, 2-color catalog describes company's complete line of precision expanding mandrels, including drawbar and thread-operated types for holes up to 18 in. in diameter through ring-sleeve and PB type mandrels for holes as small as ¼ in. Detailed drawings and dimensional specifications also are given.

Roller Chains and Sprockets

Acme Chain Corp., Holyoke, Mass. — A 108-page product catalog (No. 8) describes and illustrates company's complete line of roller chains, sprockets, flexible couplings, and hubs. In addition to general information, dimensions and price lists also are included.

Differential Pressure Gauge

Pall Corp., Glen Cove, N. Y. — A 2-page, 2-color bulletin, No. E10 describes and illustrates the differential pressure gauge. Included are specifications, drawings, and ordering information.

Pressure-Sensitive Tape

Johns-Manville, Dutch Brand Division, 22 E. 40th St., New York 16, N. Y. — "How to Select a Pressure-Sensitive Tape" is an 8-page, 2-color booklet (No. DB-56A) containing information on pressure-sensitive tapes; how they are constructed; and the factors involved in choosing a particular type for a specific application. In addition it contains one page devoted to trouble-shooting problems concerned with tape failures, a glossary of terminology applied to tapes, a listing of complete line of Dutch Brand pressure-sensitive tapes, and available technical literature devoted to specific types of tapes.

Two-Stage Oil Filters

Vickers Inc., Division of Sperry Rand Corp., Detroit 32, Mich. — A 4-page, 2-color bulletin (No. I & M-5111) describes and illustrates the OFM Series oil filters for use in mobile, industrial, and marine and ordnance hydraulic systems. Included are photographs, a cross-section drawing (showing flow paths, typical application circuits, and pressure drop curves), as well as installation recommendations.

Truck Handbook

Ford Division, Ford Motor Co., P.O. Box 608, Dearborn, Mich. — A 96-page handbook entitled "Guide to Cutting Truck Costs" contains helpful hints to truck owners, including insurance, tire care, getting the most miles per gallon of gas, and special equipment to meet individual needs. It is illustrated with photographs and drawings.

Air Power Cylinder

Hannifin Company, Dept. 656, 501 S. Wolf Road, Des Plaines, Ill. — A 4-page, 2-color bulletin, No. 0220-B1 describes and illustrates Series "C" air power cylinder in five bore sizes, ranging from 1¼ in. to 4½ in. Also included is a cutaway diagram of the cylinder, as well as specifications.

Heavy Duty Helical Gear Drives

Foote Bros. Gear and Machine Corp., 4545 S. Western Blvd., Chicago 9, Ill.—An engineering catalog describes and illustrates company's line of heavy duty enclosed helical gear drives. Incorporated are increased capacities and ratings for entire line of helical gear drives, and a simplified selection procedure, plus a description of various drive accessories and their applications.

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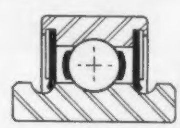

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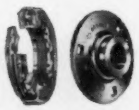

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